Georgia Department of Natural Resources

Environmental Protection Division Watershed Protection Branch

2 Martin Luther King Jr. Dr., S.E., Suite 1362 East, Atlanta, Georgia 30334 Judson H. Turner, Director Phone : (404) 656-2750 Fax : (404) 651-9590

Re: **PROCEDURE FOR PERMITTING A PROPOSED PUBLIC WATER SYSTEM**

The Georgia Rules for Safe Drinking Water (Rules of the Department of Natural Resources, Chapter 391-3-5. et seq.) defines a public water system as "a system that provides piped water to the public for human consumption, if such system has at least fifteen (15) service connections or regularly serves an average of twenty-five (25) individuals at least sixty (60) days out of the year. Such terms include: 1) 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 2) any collection or pre-treatment storage facilities not under such control which are used primarily in connection with such system. Under the Georgia Safe Drinking Water Act of 1977 (O.C.G.A. 12-5-170), any water system that meets the above definition of a public water system is required to have a **Permit to Operate a Public Water System**. Please note that a water system can have less than fifteen (15) service connections and still be considered a public water system. The minimum residential population served by a water system can be determined by multiplying the total number of active service connections by Georgia's average population per household (as published in the most recent Federal Census Bureau statistics). Based on Georgia's average of 2.6 persons per household, a system with ten (10) service connections would be considered a public water system. Also, a water system would be considered to be a public water system if an actual count (that is, a census) established an average population greater than twenty-five (25) individuals.

Any person who desires to develop or expand a public water system must first obtain approval from the Environmental Protection Division (Division or EPD).

To initiate the permitting process, the Division requires that you review and return the following items (a list of where to submit the application forms is given below):

- Application for a Permit to Operate a Public Water System
- Drinking Water Project Submittal
- Drinking Water Laboratory and Related Services Contract Application

As part of the acknowledgement of your permit application, you will then receive a three-phase permitting checklist document: **Phase I – Inquiry and Discovery**, a **Phase II – Technical Review**, and **Phase III – Permitting and Contract Services**. After an initial review of the application materials, if the information requested in the **Phase I (Inquiry and Discovery)** form is not received within ninety (90) days, then no further consideration will be given to the request for the permit application.

If the items requested on the **Phase I** checklist are complete and adequate, a seven digit (7digit) **W**ater **S**ystem **Id**entification number (**WSID**) will be issued to your proposed water system application. This WSID number must be included on all correspondence to the Division for the water system.

One of the items requested on the **Phase II (Technical Review)** form is a detailed plan of the public water system. Construction plans and specifications of the proposed system, prepared in accordance with the requirements outlined in Section 391-3-5-.05 of the Rules, must be submitted for review and approval **prior** to any construction. This submittal must be detailed enough to cover the materials and construction methods for all wells, storage tanks, water

treatment equipment, water lines and associated appurtenances. Please note that a Drinking Water Project Submittal form must be included with each project submittal.

The final step in the process will be the issuance of a **Permit to Operate a Public Water System**. A permit will not be issued until all of the previous steps have been completed.

Once a permit has been issued, compliance monitoring for microbiological and chemical sampling shall commence. It is the responsibility of the permittee to ensure that sampling schedules set by the Division are followed with conducting the appropriate sampling within the required timeframes.

It is important for permitted water systems to know and follow their drinking water sampling schedules. These sample schedules (along with inventory, sample results, violations, and other information) can be found online on the Georgia EPD "Drinking Water Watch". The internet address for the Drinking Water Watch is: <u>http://gadrinkingwater.net</u>.

The Division offers permittees the option of contracting with the Division's Drinking Water Laboratory for testing and related contract services. If microbiological analyses are to be conducted by the EPD Laboratory, a microbiological sampling kit should be ordered from the Environmental Protection Division's laboratory for a cost of \$35.00 (thirty-five dollars). If chemical sample analyses are to be conducted by the EPD Laboratory, then chemical sampling kits will begin shipments, based on the sampling schedule. A microbiological and chemical laboratory service contract application is available. Once contracted for EPD Laboratory Services, the contract carries an annual fee, based upon the type of water system, population, and number of sampling points. You do have the option of seeking the services of a private, Division-certified laboratory for microbiological and chemical monitoring. It is the permittee's responsibility to ensure that the samples are collected, analyzed and reported to the Division within the required timeframes.

Should you have any further general questions about the above permitting procedure, please call the Drinking Water Permitting and Engineering office at (404) 656-2750. For specific questions about your permit application, please contact the Drinking Water Permitting and Engineering office for surface water systems or for groundwater systems, the EPD District office shown below.

EPD Coastal District, 400 Commerce Center Drive, Brunswick, GA 31523-8251 Phone: (912) 264-7284 Fax: (912) 262-3160 For Counties: Appling, Atkinson, Bacon, Brantley, Bryan, Bulloch, Camden, Candler, Charlton, Chatham, Clinch, Coffee, Effingham, Evans, Glynn, Jeff Davis, Liberty, Long, McIntosh, Pierce, Tattnall, Toombs, Ware, Wayne

EPD West Central District, 2640 Shurling Drive, Macon, GA 31211-2629 Phone: (478) 751-6612 Fax: (478) 751-6660 For Counties: Bibb, Bleckley, Chattahoochee, Crawford, Dooly, Harris, Houston, Jones, Lamar, Macon, Marion, Meriwether, Monroe, Muscogee, Peach, Pike, Pulaski, Schley, Talbot, Taylor, Troup, Twiggs, Upson

EPD Southwest District, 2024 Newton Road, Albany, GA 31701-3576 Phone: (229) 430-4144 Fax: (229) 430-4259 For Counties: Baker, Ben Hill, Berrien, Brooks, Calhoun, Clay, Colquitt, Cook, Crisp, Decatur, Dodge, Dougherty, Early, Echols, Grady, Irwin, Lanier, Lee, Lowndes, Miller, Mitchell, Quitman, Randolph, Seminole, Stewart, Sumter, Telfair, Terrell, Thomas, Tift, Turner, Webster, Wilcox, Worth

EPD Northeast District, 745 Gaines School Road, Athens, GA 30605-3129 Phone: (706) 369-6376 Fax: (706) 369-6398 For Counties: Baldwin, Banks, Barrow, Butts, Clarke, Elbert, Franklin, Greene, Hall, Hancock, Hart, Jackson, Jasper, Lincoln, Madison, Morgan, Newton, Oconee, Oglethorpe, Putnam, Stephens, Taliaferro, Walton, Wilkes

EPD East Central District, 3525 Walton Way Extension, Augusta, GA 30909 Phone: (706) 667-4343 Fax: (706) 667-4376 For Counties: Burke, Columbia, Emanuel, Glascock, Jefferson, Jenkins, Johnson, Laurens, McDuffie, Montgomery, Richmond, Screven, Treutlen, Warren, Washington, Wheeler, Wilkinson

EPD Mountain District, P O Box 3250 16 Center Road, Cartersville, GA 30120-3250 Phone: (770) 387-4900 Fax: (770) 387-4906

For Counties: Bartow, Carroll (industrial only), Catoosa, Chattooga, Cherokee, Cobb, Dade, Dawson, Fannin, Floyd, Forsyth, Gilmer, Gordon, Habersham, Haralson, Lumpkin, Murray, Paulding, Pickens, Polk, Rabun, Towns, Union, Walker, White, Whitfield

EPD Mountain District, 4244 International Pkwy Suite 114, Atlanta, GA 30354-3906 Phone: (404) 362-2671 Fax: (404) 362-2712

For Counties: Carroll, Clayton, Coweta, DeKalb, Douglas, Fayette, Fulton, Gwinnett, Heard, Henry, Rockdale, Spalding

Georgia Environmental Protection Division District Offices



Important Documents to Review

- Application for a Permit to Operate a Public Water System
- Drinking Water Project Submittal
- Drinking Water Laboratory and Related Services Contract Application
- Public Water System Review & Permitting Process Checklist (Phases I, II, and III)
- Georgia Rules for Safe Drinking Water (Chapter 391-3-5)
- Minimum Standards for Public Water Systems
- Wellhead Protection New Well/Spring Application Form
- Well Data Completion Form
- Business Plan Manual for Assessing Water System Capability
- Trust Indenture Form
- Microbiological Water Sample Shipping Case Request Form and Sampling Instructions
- TTHM / HAA5 Monitoring Plan Form
- US Environmental Protection Agency Quick Reference Guides
 - Standard Monitoring Framework
 - o Total Coliform Rule
 - o Revised Total Coliform Rule
 - Lead and Copper Rule
 - o Arsenic Rule
 - o Comprehensive Surface Water Treatment Rules
 - o Radiological Rule
 - Public Notification Rule
 - Consumer Confidence Report Rule

GEORGIA ENVIRONMENTAL PROTECTION DIVISION COMMUNITY WATER SYSTEM REVIEW and PERMITTING PROCESS

Date:	
System Name:	
Owner's Name:	
Owner's Address:	

WSID: County: Telephone: City, State, Zip:

SID:	
inty:	
one:	
Zip:	

PHASE I - INQUIRY & DISCOVERY

(REFER ONLY TO ITEMS MARKED)

ANY PERSON WHO DESIRES TO OWN OR OPERATE OR WHO DESIRES TO COMMENCE THE OPERATION OF A PUBLIC WATER SYSTEM MUST FIRST EVALUATE CONNECTING TO AN EXISTING LOCAL GOVERNMENTALLY OWNED AND OPERATED PUBLIC WATER SYSTEM.

- (1) Obtain and review an <u>Application for a Permit to Operate a Public Water System</u>. Review the <u>Georgia Rules for Safe Drinking Water</u>.
- (2) Submit a map showing the geographical location of the proposed project, as well as the location of the governmentally owned and operated public water system closest to the project site.
- (3) Provide written certification from the local government in which the system is located that the local government is in concurrence with the development of the privately owned community public water supply system within its jurisdiction.
- (4) Submit documentation outlining the reasons why the proposed project cannot connect to an existing local governmentally owned water supply system. A written letter must be attached from the nearest governmentally owned (City or County) water system, denying the owner's request for water service.
- (5) Provide written concurrence by the nearest governmentally owned water supply system to provide water to the proposed project. This letter must indicate that the water supply system has adequate capacity available to provide water to the proposed project. The entity that will own, operate and maintain the water distribution lines must be clearly stated.
- (6) Submit a letter, written by the local county government, certifying that the proposed water system development project and the appurtenances pertaining to the water system are not located on or in close proximity to an abandoned landfill or any other site used for waste disposal.
- (7) Submit a detailed description of the proposed development project, including a characterization of populations served and the total number of service connections proposed for development; type, number and projected capacity of water supply source(s); water use estimates; and, the method proposed for the disposal of wastewater generated by the project (e.g., individual septic tank system or central wastewater system).

IF ALL OF THE REQUESTED INFORMATION IDENTIFIED UNDER <u>PHASE I</u> IS NOT RECEIVED WITHIN NINETY (90) DAYS FROM THE DATE OF THIS CORRESPONDENCE, NO FURTHER CONSIDERATION WILL BE GIVEN FOR THIS WATER SYSTEM DEVELOPMENT PROJECT. For reconsideration, a separate inquiry must be made to the EPD Drinking Water Program Permitting and Engineering Unit (for surface water sourced systems) or the EPD District Office (for groundwater sourced systems).

GEORGIA ENVIRONMENTAL PROTECTION DIVISION COMMUNITY WATER SYSTEM REVIEW and PERMITTING PROCESS

Date:	
System Name:	
County:	

WSID: _____ Source ID:

PHASE II - TECHNICAL REVIEW

(REFER ONLY TO ITEMS MARKED)

- (1) Submit detailed engineering plans and specifications for the construction of the water system. All engineering documents must be prepared by a professional engineer licensed to practice in the State of Georgia. The documents must conform with <u>Section 391-3-5-.05 of the Rules for Safe Drinking Water</u> and applicable sections of <u>Minimum Standards for Public Water Systems</u>, and include material and construction methods for the water source installation, pump house, pumping equipment, electrical controls, storage tanks, paint coating system, water treatment equipment, distribution lines, service connections, valves, disinfection and other pertinent information. The <u>Drinking Water Project Submittal Form</u> and 24-hour pressure test (when applicable) must be included with each submittal of plans and specifications.
- (2) An engineering evaluation of the existing constructed facilities must be made by a professional engineer, licensed in the State of Georgia, to evaluate and certify conformance of the constructed water supply system facilities with all of the applicable sections of the Georgia Rules for Safe Drinking Water, Chapter 391-3-5. The engineer's certification, along with the "as-built" plans and specifications must be submitted to the EPD for review and comment. The <u>Drinking Water Project Submittal Form</u> and 24-hour pressure test must be included with each submittal of plans and specifications.
- (3) A back-up water source, such as an additional well, capable of providing adequate water service (if the primary source becomes nonfunctional) shall be provided for all new community public water systems serving more than 25 service connections.
- (4) The new water source for all new or expanded community and transient or non-transient, non-community public water systems shall be equipped with a means of measuring water flow (e.g., water meter).
- (5) All new services connected to community and non-transient, non-community water systems shall be metered.
- (6) A <u>Business Plan (a technical, financial and managerial plan)</u> is required to assure the managerial and technical capacity and which adequately accounts for all the costs of the development, maintenance and operation of the water system in compliance with the National and State Drinking Water Regulations for a minimum of five (5) years.
- (7) Submit "basis of design data" and "design calculations."
- (8) Describe how the erosion and sedimentation control will be accomplished during and after construction of this project. Compliance with the "Georgia Erosion and Sedimentation Act" (O.C.G.A. 12-7-1 *et seq.*) and <u>E&S regulations</u> and guidance is required. Prior to construction, a permit must be obtained to conduct land-disturbing activities. If applicable to your site, you must file a <u>Notice of Intent (NOI)</u>, with the Environmental Protection Division, to be covered under the General Permit for Stormwater Discharge Associated with Construction.
- (9) For any **new well or spring** to be developed as a community public water supply source for a municipality, county, or an authority, a <u>Wellhead Protection: New Well / Spring Application Sheet</u> as well as a preliminary wellhead protection evaluation must be completed and on file with EPD's Source Water Assessment & Protection Unit. Please contact the Division's Source Water Assessment & Protection Unit at (404) 656-4807 for additional information.
- (10) Prepare and submit a Source Water Assessment Plan (SWAP) for any new surface water intake in accordance with the Division's <u>Source Water Assessment and Protection Implementation Plan for Public Drinking Water Sources</u>. Please contact the Division's SWAP Unit for additional information at (404) 656-4807.

Items 11 through 16 are to be completed after approval for well construction or surface water intake is given by the Division

- (11) Submit a <u>Well Completion Data Form</u> for the well, completed and signed by a Georgia-licensed water well contractor, in accordance with the provisions of the <u>Georgia Water Well Standards Act</u>.
- (12) Physical and chemical "screening" of the raw water must be performed for the following parameters [with the

GEORGIA ENVIRONMENTAL PROTECTION DIVISION COMMUNITY WATER SYSTEM REVIEW and PERMITTING PROCESS

concentrations shown in milligrams per liter (mg/L), where applicable] by a Division-approved* water laboratory and a copy of the results submitted to this office:

рН	Alkalinity (as CaCO ₃)	Chloride Color (color units)
Fluoride	Hardness (as CaCO ₃)	Iron, Manganese, Zinc (part of Metals scan by Method 200.7 or like)
Nitrate (as N)	Nitrite (as N)	Total Nitrate & Nitrite (as N) Sulfate
Total Dissolved Solids	Turbidity (NTU)	Volatile Organic Chemical scan (by Method 524.2 or like)

This "screened" analysis must be performed as an interim measure to determine usability of the well/spring as a potential source of water supply, until an in-depth testing of the water is completed as required by the <u>US EPA's</u> <u>Standardized Monitoring Framework</u>. Please include the design engineer's contact information on the sampling form. (Note: New public water systems shall have source approval samples done by an approved outside laboratory)

(13) A raw water sample must be collected from the proposed source and submitted to a Division-approved* laboratory for microbiological analysis. A copy of the results must be submitted to this office. Please include the design engineer's contact information on the sampling form.

(Note: New public water systems shall have source approval samples done by an approved outside laboratory)

- (14) A raw water sample must be collected in a specially marked one gallon plastic container and submitted to the Division's Radiological Laboratory for radiological analysis. Contact EPD's District Office (for groundwater sources) or Drinking Water Program (for surface water sources) to arrange to have the EPD Laboratory ship a sampling container. The plastic container, necessary forms and instructions for this sampling will be sent to you under separate cover.
- (15) Contact Drinking Water Program of EPD at (404) 656-2750, for special sampling of the proposed surface water source for physical and chemical analyses or for an in-depth evaluation of the proposed groundwater sources for the influence of surface water.
- (16) Submit an <u>application to obtain a permit to use either groundwater or surface water</u> as a source of public water supply, or to modify an existing permit to reflect the addition of the new water source(s) and/or change the water withdrawal amount (permits are required for withdrawals exceeding 100,000 gallons per day). Please contact the Water Withdrawal Permitting Program at (404) 675-6236 concerning requirements for a water withdrawal permit.

(* If an existing public water system is contracted with EPD for laboratory services, samples may be submitted to the EPD Lab)

PHASE III - PERMITTING & CONTRACT SERVICES

(REFER ONLY TO ITEMS MARKED)

- (1) The enclosed "<u>Application for a Permit to Operate a Public Water System</u>" must be completed, signed and returned to this office. The system's operator information needs to be included on the submittal.
- (2) Provide proof of ownership (e.g., a copy of warranty deed or bill of sale).

(3) Provide proof that the water system has retained the services of a certified operator. The certification classification must be consistent with the public water system classification as specified in <u>Rule 391-3-5-.39</u>. A copy of the operator's certification card must be included with the submittal for verification.

- (4) To assure continuity of maintenance and operation of a non-governmentally owned community water system, the owner must file a recorded **Trust Deed** (Trust Indenture) with the Division for its review and approval. The document must be recorded with the clerk of the superior court of the county in which the project is located. A sample copy of a **Trust Deed** that has been developed by the Attorney General's office is enclosed for your use.
- (5) Submit to the Division a <u>Total Trihalomethanes and Haloacetic Acids (TTHM/HAA5) Monitoring Plan</u> developed in accordance with <u>Section 391-3-5-.24 of the Rules for Safe Drinking Water</u>.
- (6) To obtain a Georgia EPD Drinking Water Laboratory and Related Services Contract, please contact the Drinking Water Program Fee Coordinator at (404) 657-3190. Under this contract, the Georgia Environmental Protection Division (EPD) can provide for the laboratory and related services consistent with the Owner's need to comply with the National Primary and Secondary drinking water standards and related regulations in the Georgia Rules for Safe Drinking Water, Chapter 391-3-5. Entering into this contract is not a condition or prerequisite to the permit nor will entering into this contract stop or prevent EPD from fulfilling its regulatory functions with regard to the public water system. The contract can be used for either microbiological analyses, or chemical analyses, or both.
- (7) Ensure information in the <u>Drinking Water Watch</u> is correct and follow the sampling schedule.

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<u>Georgia Department of Natural Resources</u> Environmental Protection Division 205 Butler Street, S.E., Suite 1362 East Tower, Atlanta, Georgia 30334-4100 Drinking Water Program (404) 656-2750 FAX: (404) 651-9590

DRINKING WATER PROJECT SUBMITTAL FORM

Water System Name: WSID Number:
General Project Information Project Name:
Project Description:
Project Location:County:
Type of Development:
Maximum Elevation in Development:(feet)
Number of Service Connections Proposed:
Size(s) of Water Main in Project: (inches)
Length of Water Main to be Installed: (feet) Water Main Material:
Wastewater for this Project will be handled by: Septic Tank: or Sewer System: (check one)
Is this project an addition to an existing water system? Y N If YES, please indicate:
a) Static Pressure (point of tie-in):(psi) at feet elevation
b) Elevation at the point of tie-in: feet
c) Flow Available: (gpm) at (psi) residual, at the point of tie-in.
d) Size of Water Main at Point of Tie-in to Project: (inches)
${\rm e})$ Include 24-hour pressure test results for projects connecting to existing systems.
General Existing Water Supply Information
Number of Sources: Total Production Capacity: (gpm)
Number of Existing Service Connections:
Finished Water Storage Type(s): Total Storage Volume: (gallons)
PLEASE NOTE: ALL APPLICABLE APPROVALS AND/OR PERMITS RELATING TO THE CONSTRUCTION OF THE PROJECT MUST BE OBTAINED PRIOR TO THE START OF ANY CONSTRUCTION, AS REQUIRED.
To the best of my knowledge, the above named project conforms with all applicable state and local government requirements for the approval of public drinking water supply construction projects.

Name

Signature

Date

APPLICATION FOR A PERMIT TO OPERATE A PUBLIC WATER SYSTEM

1.	System Identification	1:			
	Water System ID (W	(SID):			
	Water System Name				
	County:				
	Nearest City (attach	• /			
	Previous owner & sy	stem name* (transfers	s only):		
	*A copy of th	ne warranty deed or b	oill of sale must ac	company the applic	ation for all permit transfers.
Please	e select reason for subr	nittal (New systems r	nust be approved	by EPD prior to initi	al permit issuance):
	w System	Modification		ansfer	
	0				
2.	Ownership type:				
	Governmental:				
		County	Authority	E Federal	State
	Private:		🗖 la duata i		
	☐ Individual ☐Trust	Incorporation Other	Industry	Company	Association
3.	System & service are	a characteristics:			
			tem type & service	e area. (See Definiti	ons, Rule 391-3-502):
					ce connections, used by year-roun ubdivisions, mobile home parks, etc.
	on-Transient Non-Com	munity Water System	m: a public water	system that is not	a community water system and that
					ies, schools, shopping centers, etc.)
	sgularly correct at react				
					unity water system or a non-transier
					ed water for human consumption to a
				25 persons at least (60 days a year (i.e. rest areas, parks
þ	icnic areas, churches, r	estaurants, convenie	nce stores, etc.)		
	If a seasonal operation	on, give dates of oper	ation: (Month/Dav	y begin): /	(Month/day end):/
	•	<i>,</i> 3 1		, ,	
4.	Service Connections	and Population Serv	ed:		
	Service connections				
	Service connections		greater than the		
	number of connection				
	Current community (r				
	Current non-transient				
	Current transient pop				
	Current wholesale po				
	providing water to an			e eterioties" - h	
	** See definitions in s	Section 3. System &	Service Area Chal	acteristics above	

Source information must be completed on pages 3 and 4 (See Section 10) for permit issuance. Please note that all sources must be approved by the Division prior to permit modification.

5. Distribution Storage: How many of each type tank are in use and their combined storage capacity.

Type of Tank	# of Tanks	Total Volume (Gallons)
Elevated Storage		
Clearwell(s)		
Pressure		
Ground Storage		

6. Contact Information

	Water System Owner	Water System Operator in Responsible Charge	Other (Please Specify)
Name			
Title			
Mailing Address			
City, State Zip Code			
Physical Street Address			
(for UPS & other deliveries)			
City, State Zip Code			
Telephone Number			
Fax Number			
Emergency Number			
Email Address			

Water System Operators: List below all water system operators (use additional pages as necessary):

Name	Title	Certification Number	Certification Class	Expiration Date

7. Privately owned <u>community</u> water systems must provide an acceptable trust deed for continuity of operation and maintenance of the water system, unless specified otherwise in the Rules (Rule 391-3-5-.04). An acceptable blank trust deed will be provided by the Environmental Protection Division (EPD) upon request. (Note: A trust deed is not required for governmentally owned systems or non-community systems.)

Name of Water System Trustee:

8. I understand the Director of EPD is relying upon the accuracy of the information provided herein and in accordance with Section 9 of the Georgia Safe Drinking Water Act of 1977. I shall upon request of the Director or his representative, provide such additional information as may be necessary to complete final disposition of the application. I further understand it is unlawful for any person to own or operate a public water system, except in such a manner as to conform and comply with all rules, regulations, orders, and permits established under the provisions of the Georgia Safe Drinking Water Act of 1977 and applicable to the waters involved.

	Date:		
Name of Owner of the Water System as it will appear on the permit (Individual, City, County, Company, etc.) Please P			
Owner's or Authorized Agent's Signature:	Title:		
9. For governmentally owned water systems (Cities, Coun	ities, Authorities):		
To the best of my knowledge, the water system is in compliance for all counties in which its boundaries lie.	e with the Service Delivery Strategy (House Bill 489, 1997)		

Owner's or Authorized Agent's Signature:

Date:

10. Sources of water supply (attach additional pages if necessary), if not applicable to your system enter N/A:

Please indicate all sources of water supply for the water system:

Surface Water (Identify each	plant or	plant section and the	e source of water	supply):
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Plant	# of Filters	Filter Area (ft ²)	Filter Rate (gpm/ ft ²)		Source(s)	Production Capacity (MGD)	Design Capacity (MGD)	
Surface Water Withdrawal Permit #: Permitted Withdrawal (MGD): Max 24 Hour: Monthly Average:								
Treatment provide	ed to surface wat	er sources (che	eck all that apply):				
Chlorination	Fluorio	langanese	☐ Filtration ☐Taste/Odor C	Control	Aeration		on Control	
Springs:								
Source #	Spring Name	/#	Location		Production Capacity (GPM)	Treatment Plant #	GWUDI? (Y/N)	
Treatment provide	ed for spring sour	ces (check all	that apply):					
Chlorination	Fluorio	langanese	☐ Filtration ☐Taste/Odor C	Control	Aeration		on Control	
Sources of purch	acad water (Ide	antifu agab Dur	abaaa Watar Sur	nlior):				
Sources of purch		ale System	Water System I Wholesale	D # of	Average Dai Purchase (GF	provid	al treatment led by aser?	
Treatment provide	ed to purchased v	water (check al	I that apply):					
Chlorination	Fluorio	langanese	☐ Filtration ☐Taste/Odor C	Control	Aeration		on Control	

Groundwater Sources:								
Source #	Well #	Location		Well Yield (GPM)	Pump Capacity (GPM)	Treatment Plant #		
Groundwater Use	Permit #:		Total	Permitted Withd	rawal (MGD):			
	ng a municipality	county or authority			ed as a source for a he Wellhead Protection			
Treatment provide	d to groundwater	sources (check all t	hat apply):					
Chlorination	Fluorid	anganese 🗍 Ta	ltration ste/Odor Co	☐ Aerati ntrol ☐ Other	on 🗌 Co (specify):	orrosion Control		
11. Does this permit application affect or require another environmental permit or license or certification issued by the Georgia Environmental Protection Division? Air Quality Asbestos Dam Safety Drinking Water Erosion/Sediment Hazardous Waste Lead-based Paint Radioactive Matrls Scrap Tires Solid Waste Stormwater Underground Underground Wastewater Water Withdrawal Mell Drilling Other (specify): Other (specify): Stormwater Other (specify):								
12. Will the applicant use the Drinking Water Laboratory and Related Services Contract to have the required chemical or microbiological testing performed and results transmitted to the Drinking Water Program? □ No □ Yes (if Yes, please indicate below and complete the Drinking Water Laboratory Contract Application Form) □ Chemical / Cryptosporidium □ Bacteriological Coliform / E. Coli								
(Note: This section s	(Note: This section should be completed for either New System or Transfer permit applications.)							

APPLICATION TO REVISE INVENTORY INFORMATION FOR A PUBLIC WATER SYSTEM

1. System Identification:

Water System ID (WSID): Water System Name: Previous owner & system name* (transfers only): *A copy of the warranty deed or bill of sale must accompany the application for all permit transfers.

2. Service Connections and Population Served:

Service connections currently in use	
Service connections applying to serve (no greater than the number of connections currently approved by EPD)	
Current community (residential) population	
Current non-transient population	
Current transient population	
Current wholesale population (applies only to systems providing water to another permitted water system)	

3. Contact Information

	Water System Owner	Water System Operator in Responsible Charge	Other (Please Specify)
Name			
Title			
Mailing Address			
City, State Zip Code			
Physical Street Address (for UPS & other deliveries)			
City, State Zip Code			
Telephone Number			
Fax Number			
Emergency Number			
Email Address			

4. Sources of water supply (attach additional pages if necessary), if not applicable to your system enter N/A:

Please indicate all sources of water supply for the water system:

Surface Water (Identify each plant or plant section and the source of water supply):

Plant	# of Filters	Filter Area (ft ²)	Filter Rate (gpm/ ft ²)	Source(s)	Production Capacity (MGD)	Design Capacity (MGD)

Springs:

Source #	Spring Name/#	Location	Production Capacity (GPM)	Treatment Plant #	GWUDI? (Y/N)

Groundwater Sources:

Source #	Well #	Location	Well Yield (GPM)	Pump Capacity (GPM)	Treatment Plant #

Groundwater Use Permit #:

Total Permitted Withdrawal (MGD):

5. I understand the Director of EPD is relying upon the accuracy of the information provided herein and in accordance with Section 9 of the Georgia Safe Drinking Water Act of 1977. I shall upon request of the Director or his representative, provide such additional information as may be necessary to complete final disposition of the application. I further understand it is unlawful for any person to own or operate a public water system, except in such a manner as to conform and comply with all rules, regulations, orders, and permits established under the provisions of the Georgia Safe Drinking Water Act of 1977 and applicable to the waters involved.

 Date:

 Name of Owner of the Water System as it will appear on the permit (Individual, City, County, Company, etc.) Please Print

Owner's or Authorized Agent's Signature: ______ Title:

6. For governmentally owned water systems (Cities, Counties, Authorities):

To the best of my knowledge, the water system is in compliance with the Service Delivery Strategy (House Bill 489, 1997) for all counties in which its boundaries lie.

Owner's or Authorized Agent's Signature:

Date:

WELLHEAD PROTECTION / NEW WELL/SPRING APPLICATION SHEET

Georgia Department of Natural Resources

Environmental Protection Division

FOR COMMUNITY - MUNICIPAL DRINKING WATER SYSTEMS ONLY

This is a preliminary data check to expedite permitting of new drinking water sources for municipal - community systems. A separate application must be filed for each new well.

System Name:	County:			
System ID. No System Permit No		Proposed Well/Spring No.		
Owner:Address:	Applicant: Address:			
City/State/Zip: Phone No.: ()	City/State/Zip: Phone No.:			
Well/Spring Address if applicable: Submit a map - mark the well location on a USGS 7 ½ minute to Is the well site located within a 100 year flood plain zone as defin Ground Elevation: ft. MSL, Longitude: W	ed by FEMA?	yes	-	-
PROPOSED WEI Provide a well con Proposed Drill Date: Proposed Total Depth:	struction diagram		te:	gpm
Name and Georgia License # of proposed driller :				
<u>PROPOSED DRILLING METHOD</u> (Indicate)	PROPOSED WE	LL SCREEN /	OPEN HOLE IN	<u>TERVAL</u>
Rotary: Percussion: Other:	From: From:	ft. To: ft. To:	ft. ft.	
PROPOSED CASING INTERVAL	<u>PROPOSED GR</u>	OUTING MAT	ERIAL & INTE	RVAL
From:ft. To:ft. From:ft. To:ft.	Material: From:		То:	ft.
<u>PROPOSED BACKFILL MATERIAL & INTERVAL</u> Material: From:ft. To:ft.	Please submit dr are available.	illers logs fron	n nearby wells if t	they
PROPOSED WELLHEA	D PROTECTIO	N AREA		
15 ft. radius from wellhead	<u>DL ZONE</u>			
PROPOSED INNER-MANAG	EMENT ZONE: ((indicate on	e)	

<u>Aquifer Type</u>	Wellhead Protection Area	Key to Map				
 Karst	500 ft. radius from the wellhead	K				
 Piedmont Fractured Crystalline Rock	250 ft. radius from the wellhead	Р				
 Coastal Plain Unconfined	250 ft. radius from the wellhead	С				
 Coastal Plain Confined (attach documentation)	100 ft. radius from the wellhead	С				
All wells in the Coastal Plain will be considered unconfined unless shown to be otherwise.						

PROPOSED OUTER-MANAGEMENT ZONE:

For the purpose of this application a proposed outer-management zone of one mile radius will be considered when identifying the potential pollution sources listed on the back side of this application. The final outer-management zone will be dependent upon well construction and the geology of the wellhead protection area. The final radius may range from 100 feet to several miles.

POTENTIAL POLLUTION SOURCE INVENTORY WITHIN THE PROPOSED WELLHEAD PROTECTION AREA

Indicate whether any of the potential pollution sources are present. EPD will not permit the well/spring if any of the following are present within the inner management zone.

commercial animal enclosures poultry enclosures or animal feedlo	ts
underground storage tanks	
non-domestic septic systems	

Further investigation will be necessary if any of the following lie within one mile of the proposed site.

yes	no		yes	no
		domestic septic systems		commercial animal enclosures
		municipal solid waste landfill		animal feedlots
		industrial waste landfill		quarries/underground mines
		construction waste landfill		underground storage tanks (unmonitored)
		hazardous waste disposal		waste water treatment basins
		facilities handling hazardous waste		non-domestic septic systems
		agricultural waste impoundments		underground injection wells
		land application of waste water/sludge		

PROPOSED ALTERNATE WATER SUPPLY

Please provide a brief description of the alternative water supply to be used in the event this well must be shut down.

		er environmental permit or li s (if Yes, please indicate belo		d by the Georgia			
 Air Quality Hazardous Waste Stormwater Well Drilling 	Asbestos Lead-based Paint Underground Injection Control Other (specify):	 Dam Safety Radioactive Matrls Underground Storage Tanks 	 Drinking Water Scrap Tires Wastewater 	 Erosion/Sediment Solid Waste Water Withdrawal 			
the Georgia Safe Drinki information as may be n own or operate a public	I understand the Director of EPD is relying upon the accuracy of the information provided herein and in accordance with Section 9 of the Georgia Safe Drinking Water Act of 1977. I shall upon request of the Director or his representative, provide such additional information as may be necessary to complete final disposition of the application. I further understand it is unlawful for any person to own or operate a public water system, except in such a manner as to conform and comply with all rules, regulations, orders, and permits established under the provisions of the Georgia Safe Drinking Water Act of 1977 and applicable to the waters involved.						
Name of Owner of the V	Vater System as it will appe	ar on the permit (Individual	, City, County, Company, e	etc.) Please Print			
Owner's or Authorized	Agent's Signature:		Title:				
For governmentally own	ned water systems (Cities, C	Counties, Authorities):					
To the best of my know counties in which its bo	• •	a compliance with the Servic	e Delivery Strategy (House	e Bill 489, 1997) for all			
Owner's or Authorized	Agent's Signature:		Date:				
	0	tural Resources, Wellhead r, Atlanta, Georgia 30334 (0,	artin Luther King Jr., Dr., a Jo Robertson			



Georgia Department of Natural Resources

Environmental Protection Division

Well Completion Data Form

2 Martin Luther King Jr. Drive SE, Suite 1152 East Tower, Atlanta, Georgia 30334 PHONE: (404) 656-4713

					Report Com	pletion [Date:
For New Construction	Under Repair/Modifica	ation 🗌 C	ompleted	Abando	ned Wells		
Property Owner Informa	ation						
Property Owner Name:				Phone:		Email:	
Company / Farm / Municipality / V	Vater System Name:					•	
Address:							
(No. a	nd Street)		(City)		(Sta	ite)	(Zip)
Well Contractor Informa	ation						
Onsite Well Driller Name:				License No.		Phone:	
Well Contractor Company Name:							
Address:							
(No. a	nd Street)		(City)		(Sta	ite)	(Zip)
Drilling under direction of Professi		ame:				License	
Well Information						l	
🗌 Public Drinking 🗌 Municipal	🗌 Industrial 🔲 Agricultural	l / Irrigation	Well 🗌 Bore	/core hole	Dewatering		
Individual Drinking Geothe		Injection	Other We	ll Type:			
Well Application or Permit Number Permit/Concurrence Letter On-		Facility	or Public Wat	er System ID):		Well Number:
County where well is located:		Latitude	e:	Long	itude:	Ele	evation:
Well Construction Descr	ription						
Well Drilling Informatio			Rotary		Percussion		Bored
Total depth of well: ft. BLS			☐ Jetted		Auger		Cable Tool
Static water level: ft. BLS	Date SWL measured:		Horizont	al	Hand-Driven	1	Hydraulic Pt.
Date Drilled:	Drilling Start Time:		Drilling F	-luid Used	Type Fluid:		
Drill Hole Diameter			Grouting	j (⊠ as ap	plicable)		
Size in., from	0 ft. to	ft.	Method:	Casing 🔲 T	remie 🗌 Packer	🗌 Hallibur	rton 🗌 Under Pressure
	ft. to	ft.	Туре: 🗌 Ве	entonite 🗌 N	leat Cement 🗌 O	ther:	_
Size in., from	ft. to	ft.	Present	From	ft. to ft.	From	ft. to ft.
Casing Record (2 as app			Permane	ent Pump	Data (🗹 as a	applicat	ole)
Primary: Black Steel Galv		NSF Rated	Pump Type:				
PVC Not Cased			Pump Diam	eter:		itlet size:	
Secondary: Telescope Line	r 📋 Surface Casing		Motor HP:			otor RPM:	
Wall Thickness in.			Pump Capad				c Head:ft.
Weight per foot	SDR		-	t:	_	· ·	cted: Yes No
Size: in., from	0 ft. to	ft.		lled: 🗌 Yes			Rating:
Size: in., from	ft. to	ft. ft.	-			Diameter	Yes No
Size: in., from Size: in., from	ft. to ft. to	<u>ار،</u> ft.			installed: Yes		r in.
Size: in., from		Π.	-		✓ as applica		
Type material						atic water l	evel: ft. BLS
Size: in., from				Rated:		HP	
Size: in., from				uous Hours			
Size: in., from	ft. toft.				Yes No		
Size: in., from				e Stabilizatio		stained Yie	eld: GPM
Type Filter (Gravel) Pack	Disinfected:	Yes 🗌 No	Total Drawc			ecific Capa	
	t. to <u>f</u> t.	_		ater Level:			
	t. to <u>f</u> t.			Minutes to Re			
Filter Pack to Formation Ratio:		:		ped: 🗌 Yes		ell Disinfect	ted: 🗌 Yes 🗌 No

Well Application or Permit Number:



Well Construction Description (continued)

Wen construction Description (continued)	
Protection from Pollutants (☑ if done)	Construction Techniques (☑ if done)
Upgradient from pollutant sources	Drill cuttings, materials removed Well disinfected
\square >10 ft. sewer line \square > 50 ft. septic tank	Casing, liner pipe joints watertight Sanitary seal
\square >150 ft. seep pit \square > 100 ft. septic drain field	Grouted to 10 ft. (Individual) 20-50 ft. (Irrigation, Nonpublic)
\square > 100 ft. animal enclosure \square protected from runoff	□ Concrete Curbed/Pad > 4 in. thick, extend > 2 ft., sloped
\Box casing > 2 ft. above floodplain or highest known flood	Gravel/Filter pack washed, disinfected
□ Water-bearing formations sealed if likely to be polluted	Casing material new or meets national standards
Health Dept. notified Health Dept. variance	Well screen – optimal development, low head loss & clog
	Drilling equipment steam cleaned

Driller's Well Log (lithologic stratigraphy)

Feet (BLS)		Tune Meterial Encountered	Domorika	Indicate Water
from	to	Type Material Encountered	Remarks	Bearing Zones
0				

(If more space is required, use additional sheets. If available, submit any additional pump test data or geophysical logs.)

This well was drilled and constructed (or plugged/abandoned, if applicable) in accordance with the Georgia Water Well Standards Act, O.C.G.A. 12-5-120 *et seq.*, Georgia Groundwater Use Act, O.C.G.A. 12-5-90 *et seq.* and 12-5-105 *et seq.*, Georgia Safe Drinking Water Act, O.C.G.A. 12-5-170 *et seq.*, and applicable Georgia Department of Natural Resources' rules, regulations and guidance documents.

I certify that this well was drilled to ANSI / AWWA Standard A100-06 (Water Wells): 🗆 Yes 🗋 No 🗋 Not Applicable

I certify that the information on this form (Pages 1 and 2) is correct and true to the best of my knowledge.

Signature of Licensed Well Contractor's Name	License Number	Date	
Signature of Licensed Geologist/Engineer's Name	License Number	Date	
	License Number	Date	



Georgia Department of Natural Resources

2 Martin Luther King Jr. Drive SE, Suite 1152 East Tower, Atlanta, Georgia 30334

Environmental Protection Division

PHONE: (404) 656-4713

Well Construction Application Form

				Report Com	pletion	Date:	
For New Construction Under Repair/Modification	on 🗌 Co	ompleted	Abando	ned Wells			
Property Owner Information							
Property Owner Name:			Phone:		Email:		
Company / Farm / Municipality / Water System Name:			1				
Address:							
(No. and Street)		(City)		(Sta	te)		(Zip)
Well Contractor Information			T		1		
Onsite Well Driller Name:			License No.		Phone:		
Well Contractor Company Name:							
Address:							
(No. and Street)		(City)		(Sta	te)		(Zip)
Drilling under direction of Professional Geologist or Engineer Nam	e:				License	e No.	
Well Information							
Public Drinking Municipal Industrial Agricultural Induvidual Drinking Geothermal Test / Monitoring				Dewatering			
Well Application or Permit Number:							
Permit/Concurrence Letter On-site	Facility	or Public Wa	iter System ID	:		_Well Number	
County where well is located:	Latitude	e:	Long	itude:	E	levation:	
Well Construction Description							
Well Drilling Information		Rotary		Percussion		Bored	
Total depth of well: ft. BLS Drill Hole Diameter:	in.	Jetted		🗌 Auger		Cable Too	bl
Proposed Aquifer:				Hydraulic	Pt.		
Expected Date to Drill:		Use Dri		Type Fluid:			
Casing Information (2 as applicable)				tion (🗹 as ap	-		
Primary: Black Steel Galvanized Stainless PVC-NS	F Rated			remie 🗌 Packer		urton 📙 Unde	r Pressure
PVC Not Cased Other:				leat Cement 🗌 Ot			
Secondary: Telescope Liner Surface Casing		Present	-		From	ft. to	ft.
Protection from Pollutants (☑ if done)				nniques (⊠ if			
Upgradient from pollutant sources		_		, materials			пр
\square >10 ft. sewer line \square > 50 ft. septic tank		Casing, liner pipe joints watertight Install Sanitary seal					
\square >150 ft. seep pit \square > 100 ft. septic drain field		Grout to 10 ft. (Individual) 20-50 ft. (Irrigation, Nonpublic)					
\square > 100 ft. animal enclosure \square protected from runoff		Install Concrete Curb/Pad > 4 in. thick, extend > 2 ft., sloped					
casing > 2 ft. above floodplain or highest known flood Wash, Disinfect Gravel/Filter pack Water-bearing formations sealed if likely to be polluted Casing material new or meets national standards							
Water-bearing formations sealed if likely to be polluted		,					
□ Notify Health Dept. □ Receive Health Dept. variance			clean drilling e	timal development	, iow nea	au iuss & ciug	
This well will be drilled and constructed (or plugged	/ahando		5	• •	ith the	Georgia Wa	ater Well

This well will be drilled and constructed (or plugged/abandoned, if applicable) in accordance with the Georgia Water Well Standards Act, O.C.G.A. 12-5-120 *et seq.*, Georgia Groundwater Use Act, O.C.G.A. 12-5-90 *et seq.* and 12-5-105 *et seq.*, Georgia Safe Drinking Water Act, O.C.G.A. 12-5-170 *et seq.*, and applicable Georgia Department of Natural Resources' rules, regulations and guidance documents.

I certify that this well will be drilled to ANSI / AWWA Standard A100-06 (Water Wells): I certify that the information on this form is correct and true to the best of my knowledge.

 Signature of Licensed Well Contractor's Name
 License Number
 Date

Georgia Department of Natural Resources

Environmental Protection Division Watershed Protection Branch 2 Martin Luther King Jr. Dr., S.E., Suite 1362 East, Atlanta, Georgia 30334 Judson H. Turner, Director (404) 656-5660

Trust Indenture

Please find enclosed a trust indenture that has been developed by the Attorney General's staff as an acceptable legal basis for assuring uninterrupted service and to provide relief for the property owners in the event of suspension of service or improper operation by the owner.

The Environmental Protection Division (EPD) is very concerned about the disruption in the continuity of service that has been occurring with many privately owned water supply systems because of decision s by the owner to shut down the water system or not to make repairs that are required to correct leaks, pump failures and other operational problems. These occurrences have caused many problems for the property owners as well as EPD.

The attached trust indenture is the prescribed form approved by the Director of EPD as required by Rule 391-3-5-(3). You must also **provide Exhibit A describing the real property and the trust indenture must be recorded with the Clerk of Superior Court in the county where the property is located.** This is the **ONLY trust indenture acceptable to the Division.** If another agency such as FHA/VA requires a different form, compliance with their requirements is your responsibility and between you and that agency.

The Trustee should preferably be a governmental entity or an incorporated property owners association. An established community utility, approved mortgagee or a title company would also be acceptable. If a Trustee other than one of the above is proposed, it will be necessary that the Grantor and Trustee supply, to the Division, written statements indicating the proposed Trustee's relationship to the Grantor, does not create a conflict of interest for the Trustee. The mailing address and telephone number for each principal signing the trust deed must be provided as an attachment to the trust indenture.

Please submit an executed and recorded copy of the trust deed and the required supporting material to EPD promptly.

Enclosure

TRUST INDENTURE

THIS TRUST INDENTURE, made this ______ day of ______, 20____ by and between ______, a corporation organized and existing under and by virtue of the laws of the State of Georgia, (hereinafter called "GRANTOR" or "PARTY OF THE FIRST PART"), AND _______, TRUSTEE, a corporation duly chartered, organized and existing under and by the virtue of the laws of the State of Georgia or a government entity, (hereinafter called "TRUSTEE" or "PARTY OF THE SECOND PART").

WITNESSETH

THAT WHEREAS,

is

now the owner of property known as ______, County of ______, State of Georgia, which property is being improved and developed by the construction of dwellings thereon; and

WHEREAS, Grantor is the owner of certain property, upon which there is located (1) a well or wells and/or a water treatment plant, together with distribution facilities, and/or (2) a sewage treatment plant, individually or collectively hereinafter referred to as "the utility system" for the purpose of supplying adequate water and/or sewer service to all properties connected to or to be connected to the utility system; and

WHEREAS, the Georgia Department of Natural Resources (DNR) Environmental Protection Division (EPD) (hereinafter the "Division"), will not permit the operation of said utility system without assurance of continuity of maintenance and operation, as provided by DNR Rules 391-3-5-.04(3) and 391-3-6-.06(13), among other written requirements; and

WHEREAS, it is the intention and purpose of the Grantor that such utility system shall be used and operated to provide adequate disposal of sewage and an adequate supply of water for each of the properties connected thereto, regardless of the ownership of the individual properties, and properly to maintain the utility system to assure the continuance of the operation and maintenance of said system for the benefit of the present and future owners of the properties connected thereto.

NOW THEREFORE, for and in consideration of the undertakings of the Grantor to provide and assure the maintenance and operation of the utility system as aforesaid and the further sum of One Dollar (\$1.00) lawful money of the United States cash in hand to Grantor does hereby grant and convey to the party of the second part, as Trustee, the following property, to wit:

All the rights, title and interest in and to the following described real property as set forth in Exhibit A which is attached hereto and made a part hereof.

(A) The sewage collection system including all appurtenances such as

manholes, pumping stations, etc. and the sewage treatment plant including effluent line to point of final disposal, heretofore constructed or to be constructed, including all easements incident to the ownership and operation of said sewage system.

(B) The well or wells, plant, chemical treatment facilities, storage and distribution facilities, including the water mains and lateral lines, heretofore constructed or to be constructed, including all easements incident to the ownership and operation of said water system.

Further, the Grantor hereby warrants that there are no existing encumbrances, liens, or other indebtedness to the title of the utility system conveyed hereunder, other than those set out in Exhibit B which is attached hereto and made a part hereof.

Grantor further warrants that the said encumbrances, liens, or indebtedness (if any) have been subordinated to this conveyance and are subject to this Trust Indenture.

This conveyance is upon the trusts and for the purposes following, to wit:

1. This grant is for the benefit of the present and future owners of all and each of the properties now or hereafter connected to the said utility system, as well as the holders of the mortgages covering each of the said properties, and Trustee shall hold the title to the property granted by this indenture until either (a) the utility system is taken over by either a governmental authority or public utility for maintenance and operation, or (b) other adequate utility service is provided either by a governmental authority or public utility through means other than the operation of the utility and facilities now transferred to the Trustee herein. Upon the happening of either of such events at a time when the Grantor is still operating and managing the utility system in accordance with the terms and provisions hereof, the Trustee shall immediately reconvey the property to the Grantor, its successors or assigns, and this indenture shall be of no further effect.

The Grantor shall supply at all times and under adequate pressure for the 2. use of each of the properties duly connected to the said utility system, a sufficient quantity of potable water to meet the reasonable needs of each of the properties duly connected to said utility system. Such water shall be of the quality and purity as shall meet the Georgia Safe Drinking Water Act of 1977, as amended, and the Rules, Chapter 391-3-5 adopted under the Act, so as to produce water without excessive hardness, corrosive properties, or other objectional characteristics making it unsafe or unsuitable for domestic use or harmful to any or all pipes within and/or without the dwellings. In addition, the Grantor agrees to provide at all times, for each of the properties connected to the said utility system, service adequate for the safe and sanitary collection, treatment, and disposal of all domestic sewage from said dwellings, in accordance with the 1972 Federal Water Pollution Act, as amended, of the U.S. Environmental Protection Agency (EPA), and the Georgia Water Quality Control Act, as amended, and the Rules, Chapter 391-3-6 adopted under the Act. The Grantor further shall operate and maintain the utility system so as not to pollute the ground, air or water in, under or around said properties with improperly or inadequately treated sewage, or with noxious or offensive gases or odors. The Grantor further agrees to operate the utility system in accordance with the requirements of the Division, to produce a treated wastewater effluent of a quality satisfactory to the Division. Records of any and all tests conducted in connection with said utility system shall be kept by the Grantor, as required by the Division, and said records shall be open to inspection by the Division and the owners of the properties connected to the said utility system.

The Division shall at all times have access to the utility plants of the Grantor to conduct any and all tests as the Division shall consider necessary to determine compliance with the said requirements. In any event, the Grantor shall conduct all tests required by operating permits issued by the Division and shall pay all costs in connection therewith. In the event the Division shall determine that the operation of the utility system does not meet all applicable requirements, the Grantor shall, with reasonable dispatch at its sole cost make any adjustment, repair, installation, or improvement that shall be necessary or recommended by the Division to bring the operation of the utility system up to the said requirements.

3. The Grantor shall maintain said utility system at all times in good order and repair so that satisfactory service as aforesaid may be supplied to each of said properties as provided in paragraph 2 above.

4. Until the happening of one of the events set forth under paragraph numbered 1 above: Should Grantor fail to operate and manage the utility system in the manner and under the conditions specified in paragraphs numbered 2 and 3 above and should Grantor fail, after notice in writing from the Trustee to correct such failure with reasonable dispatch, then Trustee shall take immediate possession or the utility system for the purpose of operating and maintaining the same, and shall hold, use, operate, manage, and control the same either itself or by or through any of the agencies or parties for whose benefit this trust is created and it shall take possession thereof for the purpose of operating the same, and in that event, the Trustee or the entity operating the utility system in its behalf or in the behalf of any of the beneficiaries of this trust, shall be subrogated to all rights of the Grantor to levy and collect a charge against each customer.

5. In the event the Trustee takes possession of the utility system pursuant to the provisions of paragraph numbered 4 the Grantor shall have no further right, title or interest in the utility system or other property granted by this indenture and shall not be entitled to any portion of the proceeds resulting from any sale of such utility system or property; but the Trustee shall have the right to transfer such utility system to a governmental authority upon such terms or conditions as may be approved by the Trustee and the owner or owners of a majority of the properties connected to the utility system.

6. The Grantor reserves the right to levy and collect a charge for utility services provided to the occupants of each of the properties connected to the utility system. Services shall be charged on a prorate basis from the date the services are established at the request of a customer, to the date of its discontinuance. In connection with the foregoing, the Grantor shall have be maintained by the Grantor, through which all water supplied to the consumer or consumers shall pass and to which the Grantor shall have access at reasonable times for the purpose of taking meter readings and keeping said meter in repair.

7. If it should become necessary at any future time for the Trustee or any entity acting in its behalf or any beneficiary under this trust indenture, to take over, operate, and manage the utility system under the provisions of this trust, then and in that event, the operator of such systems shall be entitled to a Trustee's fee payable from the income of the utility system at a rate not in excess of fifteen 15% of the gross charges collected by such Trustee, provided that such Trustee's fee may be increased with the approval of the owner or owners of seventy-five (75) percent of the properties connected to the said utility system.

8. Should the Trustee or any entity acting in its 'behalf or any beneficiary under this trust indenture, take over, operate and manage the utility system under the provisions of this trust, the Trustee shall notify the Division within thirty (30) days of such take over and shall meet all the requirements of the Grantors permits issued by the Division.

9. If the Trustee named herein shall cease to serve as Trustee before the termination of this Trust Indenture, then a successor Trustee may be selected by the Grantor with the approval of a majority of the beneficiaries. To ensure the continuity of the maintenance and operation of the water system, approval of the successor Trustee shall also be obtained from the Director of the Division, but this must occur prior to the release of the first Trustee. If a majority of the beneficiaries or the Director are unable to agree on the appointment of a successor Trustee within a reasonable time, either the Grantor or beneficiaries may petition any Court to select and appoint such successor Trustee.

10. Whenever the word "Grantor" occurs herein, it shall also include its successors and assigns; and whenever the word "Trustee" occurs herein, it shall include the successor Trustee and successors and assigns.

The Grantor warrants that all property described in "A" (above) as well as all equipment, materials, tools, appurtenances, etc. associated with the normal daily operation and maintenance of the utility system hereinafter acquired by the Grantor shall be made subject to the Deed by recording of appropriate covenants, required by Georgia law to put all persons on notice that such properties have been subjected to the terms of this Deed.

In Testimony Whereof ______, the Grantor, has caused these presents to be executed by herself and the Trustee herein named, has caused these presents to be executed by himself the day and year first hereinabove written. In entering into the agreement contained herein and executing the Trust Indenture, ______ acts for himself as Trustee and as representative of any by authority of all persons, firms, corporations, or entities which are or may be beneficiaries under the trust hereby created.

(Grantor	's Name)
(As to Grantor) Signed, sealed a	and delivered in the presence of:
(Grantor's Signature)	(Witness Signature)
(Type or Print Name Above)	(Type or Print Name Above)
(Name of Notary Public)	(Name of Notary Public)
(Seal of Notary Public)	(Seal of Notary Public)
(Trustee	's Name)
(Trustee's Signature)	(Witness Signature)
(Type or Print Name Above)	(Type or Print Name Above)
(Name of Notary Public)	(Name of Notary Public)
(Seal of Notary Public)	(Seal of Notary Public)

NO-IDENTITY-OF-INTEREST

The Trust Indenture for the _____ Water System located in _____ County Georgia does not create a conflict of interest for either the owner of the trustee as they are not related by blood or marriage and they have not entered into any business relationship which would compromise this agreement.

(Owner's Signature)	(Trustee's Signature)
(Type or Print Name Above)	(Type or Print Name Above)
(Owner's Address)	(Trustee's Address)
(Owner's Phone)	(Trustee's Phone)

ADDENDUM TO TRUST DEED

1. The Grantor reserves and has the right to establish and collect as a charge of charges for water furnished and consumed by the owners or occupants of each of the buildings, residences and other. improvements at the initial rates described in the rate schedule set out below. The Grantor shall have the right to install on the premises of each of the individual buildings, residences and other improvements a water meter to be maintained by the Grantor through which all water supplied to the consumer shall pass and to which the Grantor shall have access at reasonable times for the purpose of taking meter readings and keeping said meters in repair. In the event said meter shall be installed the Grantor may charge for water and service at the rate or rates set forth in the rate schedule set out below.

2. The Grantor may establish, amend or revise from time to time and enforce Rules and Regulations for Water Service covering the furnishing of water supply service within said, areas or subdivisions, provided, however, all such rules and regulations established by the Grantor from time to time shall at all times be reasonable and subject to such regulations as may now or hereafter be provided by law' and provided further that no such rule or regulation so established, amended or revised can be inconsistent with the requirements of this Deed nor shall the same abrogate any provision hereof. Any such rules and regulations established, amended, revised and enforced by the Grantor from time to time shall be binding upon any owners or occupant of any of the property located within-the boundaries of such areas or subdivisions the owner or occupants of any building, residence or other improvements constructed or located upon such property and the user or consumer of any water supply service.

3. Changes in the initial rate described in Paragraph One above may be proposed by the Grantor and by third party beneficiaries in this Deed in the following manner:

If within ninety (90) days after notice to the Trustee and to all parties connected to the water supply system of a rate change proposed by the Grantor, not more than one-third (1/3) of such parties have signified in writing their opposition to such proposed rate change, the Grantor may forthwith establish such new rates. If more than one-third of such parties signify, in writing, their opposition to a rate change proposed by the Grantor, or if more than one-third of such parties proposed in writing a rate change which the Grantor opposes, and the parties cannot negotiate an agreement within ninety (90) days to the reasonableness of such new rate, then the matter of the reasonableness of such new rate shall be referred to a Board of Arbiters selected as follows: The Grantor shall designate one arbiter, the objecting party shall designator one arbiter, and the two arbiters thus selected shall choose a third arbiter. The three arbiters shall make their written recommendations to the parties to the dispute as to the reasonableness of the new rates within ninety (90) days after the reference of the dispute to them. Written notice of the hearing of the dispute by the arbiters shall be given to the Grantor and to all objecting parties. All proceedings before the arbiters shall be recorded in writing.

Either side to the arbitration may present written objections to the recommendations within thirty (30) days after the decision. If no written objections are made, it shall be

considered that all parties have agreed that the new rates recommended by the arbiters are reasonable. If written objections are filed by either side, the question of reasonableness of the new rates shall be subject to the review by court of competent jurisdiction in appropriate legal proceedings initiated for such purposes. In the event of arbitration or court proceedings, the proposed change of rates shall be held in abeyance and shall not become effective until the conclusion of such proceedings.

RATE SCHEDULE

(A) The Grantor may levy and collect a charge for water availability of \$______ per month, and a charge for water used of \$______ per one thousand (1,000) gallons used.

(B) The Grantor may charge the sum of \$ ______ for the installation of a water meter for any consumer.

(C) All charges for water shall be paid by the day of each month. If said bill is not paid within the Grantor shall have the right to discontinue service to the delinquent user. The Grantor shall also have the right to charge a delinquent charge of \$_____ for any bill not paid by the ______ of the month.

(D) It is agreed between the parties hereto that for the first year of operation of the water system, the above rates shall be deemed reasonable.

This ______ day of ______, 20____

DNR/EPD WATER SUPPLY LABORATORY WATER SAMPLE SHIPPING CASE REQUEST

FOR COMMUNITY AND NON-COMM	
Water System Name:	_ Community:
Water System ID #:	
County Name:	_
OWNER'S INFORMATION:	
Name: Address: City, State, Zip: Telephone Number:	-
INFORMATION FOR THE PERSON TO RECEIV	E THE SAMPLE SHIPPING CASE:
Name: Address: City, State, Zip: Telephone Number:	-
INFORMATION FOR THE PERSON TO WHOM I	REPORTS WILL BE SENT:
Name: Address: City, State, Zip: Telephone Number:	-
Source: Well Spring	Other:
Disinfection: Chlorination Disinfection: Chlorination	UV 🗌 Other:
Number of Service Connections: Pop	oulation Served:
Attach a check for \$35.00, made payable to the Georg	
Please mail the completed form and check to the follo	wing address:
Georgia Department of Natural Resources Environmental Protection Division Microbiology Laboratory, 5804 Peachtree Corners, East Norcross, GA. 30092-3403	

Form Completed By: _____ Date: _____

FOR DNR/EPD USE ONLY – DO NOT WRITE IN BOX
EPD Region:
Number of Samples Required:
Sample Schedule Date:

<u>TTHM/HAA5 Monitoring Plan</u>

System Name:	
WSID #:	
Address:	
Contact Person:	
Phone #:	
System Type:	
Population Served:	
BACKGROUND INFORMATIC	<u>N:</u>
Number of wells:	
Number of entry points:	

Treatment provided: (check all that apply)

Fluoridation ____ Taste/Odor Control _____

Chlorination ____ Iron/Manganese Control ____ Corrosion Control _____ Other (specify)

TTHM/HAA5 SAMPLING LOCATION(S):

Attach (or draw on the back) a schematic of the distribution system showing the location of the water lines, well(s), entry point(s), storage tank(s), and the selected sampling point(s).

Note: Each selected sampling site must be from an active connection that is currently in use and must represent the maximum residence time in the distribution system.

MUST BE COMPLETED

Sampling site representing maximum residence time in the distribution system:

1. Address (preferable), lot number or detailed description:

Indicate why the sample is being taken at that particular location:

COMPLETE ONLY IF APPLICABLE:

Additional sampling sites (if multiple wells do not draw water from the same aquifer):

2. Address (preferable), lot number or detailed description:

Indicate why the sample is being taken at that particular location:

3. Address (preferable), lot number or detailed description:

Indicate why the sample is being taken at that particular location:

(CONTINUED ON BACK)

Sketch of the Distribution System

Draw the distribution system below showing the location of the water lines, well(s), entry point(s), storage tank(s), and the selected sampling point(s).

State of Georgia EPD Department of Natural Resources Environmental Protection Division

WATER CONSERVATION QUESTIONNAIRE

PART A – WATER SYSTEM INFORMATION

Sys	stem:		WSID:	Cou	unty:
	Population		Service		mber of
Served:			Connections	Sou	urces:
			Monthly Avg (MGD)	Monthly Max (MGD)	Yearly Avg (MGD)
	ount of Wa	ater	, , ,		
	duced:	tor Cold.			
Am	ount of Wa	ater Sold:			
PA	RT B – SO	URCE ME	TERING		
1.	Yes	No	Are all sources of water	for this system metered	?
2.			If all sources are not me	tered, how many source	es are metered?
3.			By what date will all sou	rces be metered?	
РА	RT C – SE	RVICE CO	NNECTION INFORMATIC	DN	
1.	Yes	No	Are all water service cor	nnections metered?	
2.			If no, what is the number of un-metered connections?		
3.	Yes	No	Are there plans to meter all service connections (including government facilities)?		
4.		If yes, by what date will all connections be metered?			
PA	RT D – WA		S AND UN-METERED US	E	
1.	Yes	Yes No No No No No Yes Unaccounted for water (UAW) in % = (Total amount water sold / Total amount water produced) * 100%)?			
2.			If yes, what is the average UAW for the past 12 months?		
3.	Yes	No	Does your system have a program to reduce or control UAW?		
4. Check all that apply below and provide the date the program began:					
Meter replacement or Meter service connections calibration program Meter service connections Water line replacement Meter Sources Reduce tank overflows Line Looping Leak detection/elimination Flushing Program Theft Prevention Other					

January 8, 2004

PART E – PLUMBING CODE AND WATER RATES

1.	Yes	No Does the water system (or other responsible government agency for this jurisdiction) adhere to low-flow plumbing requirements under O.C.G.A. 8.2.1 – 8.2.3 (1.6 gpf toilets, etc.)?				
2.			If no, when does the system plan to adopt and enforce plumbing code?			
3.	Yes	No	Are customers charged	Are customers charged for water based on actual quantity of water used?		
4.	Please a	ttach a cop	by of water rates for the sys	stem.		
PA	RT F – WA	ATER CON	ISERVATION PLAN			
1.	Yes	No	Has the water system (Water Conservation Pla	or responsible local government) officially adopted a in for this system?		
2.			If yes, when was the pla	in adopted?		
3.	Please lis	st the top tl	— hree water conservation pr	iorities for this community.		
	2			Date		
	a.			Begun:		
	b.			Date Begun:		
	C.			DateBegun:		
4.	Yes	No	Does the water system	have a long-range water supply plan?		
5.	What are communi		important improvements ne	eeded to meet the water supply needs of the		
	10 years:	:				
	20 years:	:				
6.	regard to Bill stu Preser	water con Iffers/mail (servation: outs schools/civic groups ot inquiries	larly used to communicate with your customers in Email Internet/web site Newspaper articles/newsletters Other		
7.	Who is th	ne primary	contact person in your wat	er system for issues related to water conservation?		
	Name:					
	Title:					
	Address:					
	Phone:					
	Fax:					
	Email:					
	Other:					
8.	Name of	person col	mpleting questionnaire if di	fferent from contact person identified in item 7		
	Name:			-		
	Title:					
	Phone:					

APPENDIX A

BUSINESS PLAN

Manual for Assessing Public Water Supply System Capability

WATER SYSTEM	ID:	
WATER SYSTEM	NAME:	
COUNTY NAME:		
OWNER'S NAME:		
ADDRESS:		
PHONE NO.:		

Rev.01212000.OES.1.01

REFERENCES:

"Georgia's Requirement for Business Plans", Georgia Department of Natural Resources, Environmental Protection Division, Memorandum, Edward Urheim, Drinking Water Permitting and Engineering Program, July 23, 1999.

"Guidance on Implementing the Capacity Development Provisions of the Safe Drinking Water Act Amendments of 1996", U.S.E.P.A., Office of Water, July 1998.

Iowa Department of Natural Resources, Water Supply Section, "Self-Assessment Manual for Iowa Water System Viability", December 1, 1997.

BUSINESS PLAN

I. INTRODUCTION

A. THE NEED TO "OPERATE LIKE A BUSINESS"

A water system should be "operated like a business." This is a frequently repeated phrase. But, what is meant by it? Here's one useful way to think about what it means to operate like a business:

For a successful business, a manager must be aware of changes taking place in the environment in which the business operates. It is necessary to constantly look towards the future to:
1) Cope with any threats to the survival of the business, and
2) Take advantage of opportunities to improve the performance of the business.

In the same way, owners and managers of a water system must bok towards the future. Such things as the need for financing, the impact of new regulations or the loss of key customers will present management demands that can only be met through sound business planning.

Many water systems were started at a time when the cost of providing water was low and regulatory demands were few. But times have changed! Little remains of the good old days when operating a water utility was a simple job. Not any more. Now, it is essential that all water system owners and operators prepare themselves for an uncertain future by becoming capable business managers and financial planners.

A successful manager relies on a "business plan" to assure a company (a water supply system) will be able to meet the changing demands of an uncertain future.

- A business plan requires a two-sided analysis:
- 1. Receiving income from sales to pay for capital investments and operating expenditures, and
- 2. Spending money to produce a product or service

In any business plan, the fundamental budget question is the "bottom line" -- whether income received will equal or exceed the money spent. When there is more income than expense, there is a "positive bottom line," indicating the business has done a good job of planning for challenges, and that the business will be "viable" in the future. A "negative bottom line" indicates a business has failed to respond to threats and opportunities. Such a business may be said to be "nonviable" because its ability to survive is suspect under current conditions. In such circumstances, businesses are often "restructured" to change their costs, their access to capital, or the revenues they receive for products or services, in an attempt to become viable again.

Whether a business is viable or nonviable is directly related to the planning done by the water system managers. With good information, the picture becomes crystal clear. But, when there is little information on which to build a plan, this picture becomes only bleak. A lack of information about current operations and absence of planning can severely limit the ability of a water system to meet future challenges. If a water system is not operated as a viable business, its survival as a business, as well as, its ability to achieve and maintain compliance with the drinking water regulations will be uncertain. Without a sound business plan, it will be difficult,

if not impossible, for a water system to survive in an increasingly complex world, as more stringent SDWA regulations are introduced.

B. 1996 AMENDMENTS TO THE SAFE DRINKING WATER ACT REQUIRE WATER SYSTEMS TO DEVELOP AND MAINTAIN TECHNICAL, MANAGERIAL, AND FINANCIAL CAPACITIES TO ACHIEVE HEALTH PROTECTION OBJECTIVES

The Safe Drinking Water Act (SDWA) as amended in 1996 brings significant improvements to the national drinking water program. Capacity development is an important component of the Act's focus on preventing problems with the drinking water systems. The capacity development provisions offer a framework within which the Georgia Environmental Protection Division (EPD) and public water systems can work together to ensure that systems acquire and maintain the technical, financial, and managerial capacity needed to achieve the public health protection objectives of the SDWA. The Act's capacity development provisions apply to Community Public Water Systems (CWS) and Non-Transient, Non-Community Public Water Systems (NTNCWS) and requires these water systems to demonstrate adequate capability in all three areas: technical, managerial, and financial.

What is technical capacity? The technical capacity is the physical and operational ability of a water system to meet SDWA requirements. Technical capacity refers to the physical infrastructure of the water system, including the adequacy of the source water, treatment, storage, and distribution. It also refers to the ability of system personnel to adequately operate and maintain the water system and to otherwise implement requisite technical knowledge.

A water system's technical capacity can be determined by examining certain key issues and questions, including:

- *Source water adequacy.* Does the system have a reliable source of drinking water? Is the source water of generally good quality, and is it adequately protected?
- *Infrastructure adequacy.* Can the system provide water that meets SDWA standards? What is the condition of its infrastructure, including well(s) or source water intakes, treatment, storage, and distribution? What is the infrastructure's life expectancy? Does the system have a capital improvement plan?
- *Technical knowledge and implementation*. Is the system's operator certified? Does the operator have sufficient technical knowledge of applicable standards? Can the operator effectively implement this technical knowledge? Does the operator understand the system's technical and operational characteristics? Does the system have an effective operation and maintenance program?

What is managerial capacity? Managerial capacity is the ability of a water system to conduct its affair in a manner enabling the system to achieve and maintain compliance with SDWA requirements. Managerial capacity refers to the system's institutional and administrative capabilities.

Managerial capacity can be assessed through certain key issues and questions, including:

- *Ownership accountability.* Is the system owner(s) clearly identified? Can the owner be held accountable for the system?
- *Staffing and organization*. Are the system operator(s) and manager(s) clearly identified? Is the system properly organized and staffed? Do personnel understand the management aspects of regulatory requirements and system operations? Do they have adequate expertise to manage water system operations? Do personnel have the necessary licenses and certifications?
- *Effective external linkages.* Does the system interact well with customers, regulators, and other entities? Is the system aware of available external resources, such as technical and financial assistance?

What is financial capacity? Financial capacity is a water system's ability to acquire and manage sufficient financial resources to allow the system to operate and maintain compliance with SDWA requirements.

Financial capacity can be assessed through certain key issues and questions, including:

- *Revenue sufficiency*. Do revenues cover costs? Are water rates and charges adequate to cover the cost of water?
- *Credit worthiness.* Is the system financially healthy? Does it have access to capital through public or private sources?
- *Fiscal management and controls*. Are adequate books and records maintained? Are appropriate budgeting, accounting, and financial planning methods used? Does the system manage its revenue effectively?

C. WHY, WHO, WHAT and WHEN

WHY A BUSINESS PLAN?

- The Safe Drinking Water Act (SDWA) Amendments of 1996 require all new Community Public Water Systems (CWS) and Non-Transient, Non-Community Public Water Systems (NTNCWS) to demonstrate that the proposed water system will technically, managerially, and financially be capable of meeting drinking water requirements and of providing a safe and adequate supply of water for human consumption over time. Existing water systems, when required, must similarly demonstrate that they have the technical, managerial and financial capability to remain viable.
- A Business Plan can benefit any type of a public drinking water system. It can help prevent investments in water systems that may become problems for everyone, including the owner, operator, customers, community, lender, and regulator.

• When developed, a Business Plan will provide the water system owner, operator, local officials, customers and Georgia EPD with assurances that the water system has the financial, managerial, and technical capability to reliably meet drinking water performance requirements over a period of time.

WHO CAN PREPARE A BUSINESS PLAN?

• It is preferred that the water system's engineer, financial advisor or other consultant prepare the Business Plan; however, the water system's owner or operator or any individual familiar with the system's operation, management and its finances can also develop the plan. Regardless of who prepares the Business Plan, responsibility for its validity and ultimate implementation remains with the water system owner.

WHAT TO INCLUDE IN A BUSINESS PLAN SUBMITTED FOR EPD'S REVIEW & CONCURRENCE

- All components discussed under the section, titled "Guidance on Preparing a Business Plan for a Public Water System in Georgia" must be addressed, as applicable. These components must include all and each subpart under Part I (Managerial Capacity), Part II (Financial Capacity) and Part III (Budgeting Worksheets). All questions requiring either a "Yes" or a "No" answer must be marked (1), appropriately. Any additional documents that are considered pertinent should be included as supplements.
- Provide justification or documentation for any assumptions used in completing the budgeting worksheets and preparing entries for the Business Plan. Please use narratives to describe how assumptions were made and what factors were considered.
- An Operations and Maintenance (O & M) Manual must be developed and included as an essential part of the Business Plan for the water supply system. The O & M Manual should summarize the actions necessary to identify those measures required for cost effective, efficient, safe, and reliable project start-up and continued success. If you already have an O & M Manual, submit it along with the Business Plan. If not, a submittal of an O & M Manual will be necessary, when required by the Division.

WHEN TO SUBMIT A BUSINESS PLAN

- All new (proposed) Community (CWS) and Non-Transient Non-Community Water Systems (NTNCWS) must submit an acceptable Business Plan along with the engineering plans and specifications for the Division's review and approval, prior to any construction. Any proposal or a submittal package for the development of a new CWS or a NTNCWS that does not include an acceptable Business Plan will be promptly returned to the owner UNAPPROVED, and no further consideration will be given for issuance of an operating permit for that system.
- Existing CWS and NTNCWS must submit an acceptable Business Plan as required by the Director.

GUIDANCE ON PREPARING A BUSINESS PLAN FOR A PUBLIC DRINKING WATER SYSTEM IN GEORGIA

The Georgia Rules for Safe Drinking Water, Paragraph 391-3-5-.17(1) requires all public water systems to obtain a permit from the Environmental Protection Division (EPD) before commencing operation. As a condition of obtaining the permit, the water system must submit documentation to demonstrate its **technical, managerial,** and **financial** capacity [Paragraph 391-3-5-.17(3)]. The Rules and EPD's "Minimum Standards for Public Water Systems" define the minimum documentation that must be submitted to EPD to demonstrate technical capacity. **For demonstration of managerial and financial capacity, EPD requires the submittal of a** "**Business Plan**". When a proposed public water system is required to submit an engineering report, the items required to be addressed in the business plan may be included in the engineering report. For proposed public water system not required to submit a formal engineering report, a separate business plan shall be submitted for review and concurrence. The business plan shall be submitted with the engineering plans and specifications and application for the permit to operate a public water supply system.

The "Business Plan" must be able to present all the pertinent information necessary to demonstrate the water system's MANAGERIAL and FINANCIAL capacity with respect to the drinking water regulations in effect or likely to be in effect. The prepared "Business Plan" must include, at minimum, all the required information identified under Part I (Managerial Capacity), Part II (Financial Capacity), and Part III (Budgeting Worksheets).

PART I - MANAGERIAL CAPACITY

A. ASSESSING YOUR MANAGEMENT CAPABILITIES - This section of the Business Plan must provide detailed information for items 1 through 12, listed below, and answer each of the "yes" or "no" questions asked under "Operation and Maintenance" and "Management and Administration". Any other supplemental information that may be pertinent and/or helpful in demonstrating the water system's managerial capacity must be included in the Business Plan.

- 1. A description of the organization that clearly defines primary responsibilities of all key personnel involved in the management and operation of the water system and reporting relationships.
- 2. Contact information for those responsible for policy decisions, ensuring compliance with State regulatory requirements, and day-to-day operations.
- 3. Description of any contracts for the management or operation of the system and how legal, engineering, and other professional services are provided.
- 4. Identification of the ownership and description of the legal basis of the system ownership.
- 5. Description of any leases or easements for land, water supply sources, or physical facilities used in the operation of the system.

- 6. Description of the qualifications of the owners and managers of the system including experience in owning or operating other water systems.
- 7. Description of a training plan to keep management and operators current with the regulatory requirements of managing a water system.
- 8. Emergency Management Plan. For community systems, the plan should identify known and potential risks (natural or man-made) to the water system; specify the response plan; identify personnel responsible for action; and describe public notification procedures. For non-community systems, submittal of a notification plan containing names and 24-hour phone numbers of responsible persons to contact in the event of an emergency is acceptable.
- 9. Description of customer service policies, including providing customers information and handling customer complaints.
- 10. If the person in charge of operation has other responsibilities unrelated to the water system, it is necessary to provide information showing that the operator will have sufficient time and be readily available to execute his or her responsibilities reliably.
- 11. Disclosure of any encumbrances, trust indentures, bankruptcy decrees, legal orders or proceedings, or other items that may effect or limit the owner's control of the system.
- 12. Disclosure of any plans to change the ownership of the system once the system is completed and, if known, identification of the future owners.

B. OPERATION and MAINTENANCE - Operational demands placed on all water systems are rising to unprecedented levels. Some indication of whether these operational needs can be met is provided through consideration of the following series of questions. "NO" answers to the following questions indicate that the water system's future operational needs may not be fully met.

Does your operations staff have the right training and credentials?

- YES___NO___Is the person in-charge of operating your system certified at the classification required by the Georgia Rules for Safe Drinking Water, Chapter 391-3-5?
- YES__NO__ Does your operator receive training on an ongoing basis to keep abreast of current developments in the water field?

Does your staff fully understand and meet all current monitoring requirements?

YES__NO__ Do you have a history free of monitoring violations? YES__NO__ Are you aware of and do you understand provisions for obtaining waivers from monitoring requirements and the role of vulnerability assessment?

Are you confident you understand what it will take to meet future operational demands?

YES__NO__ Can you make an appraisal of the additional operational requirements on your water system based on the categories of questions presented above? (Do you

know how this forecast matches up against your current level of operational capability?)

- YES__NO__ Does your water system obtain any regular or occasional technical assistance from outside sources, such as your engineer, other utilities, or organizations specifically dedicated to providing technical assistance?
- YES__NO__Are you aware of all the assistance programs that are available to you?

C. MANAGEMENT and ADMINISTRATION - As the list of quantity, quality, and infrastructure needs of water systems grows larger and larger, the extent of management systems needed to meet all these needs also grows. The following questions highlight the general types of management systems that should exist in some form. Although some of these items may sound sophisticated, they can exist in very simple forms and get the job done very effectively. As a general rule, they need be no more sophisticated than necessary to meet the needs of the system. The important issue is that the need for management systems is recognized and is being met. "NO" answers to the following questions imply that your water system may have inadequate management systems.

Is it clear who is in charge of what?

- YES__NO__ Is there a clear plan of organization and control among the people responsible for management and operation of the system?
- YES__NO__ Are the limits of the operator's authority clearly known?
- YES__NO__Are all the specific functional areas of operations and management assigned?
- YES__NO__Does everyone involved in operations know who is responsible for each area?
- YES__NO__ Is someone responsible for scheduling work?

Are there clear rules and standards?

- YES__NO__Do you have explicit rules and standards for system modifications?
- YES NO Do you have rules governing new hook-ups?
- YES__NO__Do you have a water main extension policy?
- YES__NO__Do you have standard construction specifications to be followed?
- YES NO Do you have a "Standard Operating Procedures" manual?
- YES_NO__ Do you have measures to assure cross-connection control and backflow prevention?
- YES__NO__Do you have policies or rules describing customer rights and responsibilities?

Do you have a deliberately organized regulatory compliance program?

- YES_NO_ Do you fully understand monitoring requirements and have a scheduling mechanism to assure compliance?
- YES__NO__ Do you have a mechanism to obtain the most recent information on regulatory requirements?
- YES__NO__Do you know how to obtain clarification or explanation of requirements?
- YES__NO__Do you maintain adequate records to document compliance?
- YES__NO__Do you know what to do in the event of a violation?

Are you prepared to handle emergencies?

- YES__NO__ Do you have an emergency response plan?
- YES__NO__ Is there a contingency for making emergency interconnections to neighboring systems, and do you know they will work when needed?
- YES__NO__ Does everyone involved in operations know what they are to do in the event of contamination from a toxic or hazardous waste spill in your source water or potential contamination due to a water main break or a storage tank failure?
- YES__NO__Do you have a clear chain-of-command protocol for emergency action?
- YES__NO__ Is someone responsible for emergency operations, for communications with state regulators, for customer relations, for media relations?

Are your operations conducted safely?

- YES__NO__Do you have a safety program defining measures to be taken if someone gets hurt?
- YES__NO__ Does everyone understand the risks and safety measures involved in handling water treatment chemicals?
- YES__NO__Do you have written operating procedures for both routine and emergency system operations?
- YES__NO__ Are you fully aware of OSHA confined space regulations?

Do you have an organized approach to maintenance?

- YES__NO__Do you have a system for scheduling routine preventive maintenance?
- YES__NO__ Do you have a system for assuring adequate inventory of essential spare parts and back-up equipment?
- YES__NO__Do you have relationships with contractors and equipment vendors to assure prompt priority service?
- YES__NO__ Do you have records and data management systems for system operating and maintenance data, for regulatory compliance data, and for system management and administration?

Is your management capability complete?

YES__NO__ Are you getting the outside services and technical assistance you need? Do you have adequate legal counsel, insurance, engineering advice, technical/operations assistance, rate case preparation, and financial advice?

PART II – FINANCIAL CAPACITY

A. FINANCIAL INFORMATION - This section of the Business Plan must provide detailed information for items 1 through 2, listed below, by answering to each of the "yes" or "no" questions asked, and by completing all of the Budgeting Worksheets under Part C (Expense Budget, Capital Budget, Reserves Budget, and Revenue Analysis Worksheets). Any other supplemental information that may be pertinent and/or helpful in demonstrating the water system's financial capacity must be included in the Business Plan.

- 1. An in-depth, 5-year budget that includes revenue, operating expense, reserve, and capital improvement information. The budget should include a revenue and expenditure analysis that compares all anticipated water system revenues with planned expenditures; an identification of reserve accounts for emergency funding and equipment replacement needs; and when applicable, a capital improvement plan that identifies future projects, and their estimated costs.
- 2. A description of the budget and expenditure control procedures and the reports that assure adequate budget control; purchasing procedures or policies to prevent misuse of funds; and a demonstration that the system has adopted generally accepted accounting and auditing procedures (GAAP).

B. ASSESSING YOUR FINANCES - The answers to the previous questions under Managerial Capacity may have alerted you to the potential for higher levels of both capital and operating costs. Any system that can show that they have anticipated all their needs and that they are prepared to charge a rate sufficient to meet the annual revenue requirement implied by those needs, is a system that can obtain capital financing and can pay its bills -- it is financially viable. The following questions illustrate some features of "good" financial planning and management to serve as points of comparison for self-assessment. Although every system cannot achieve perfection, the more "yes" answers you have, the better it is. Use the budgeting worksheets under Part C to assess projected costs, financing, and revenue requirements.

Are current financial planning mechanisms adequate?

- YES__NO__Do you have an annual budget?
- YES__NO__Does your budget process provide for depreciation of the existing plant or funding reserves?
- YES__NO__ Do you use the budgeting process to determine your annual revenue requirement via either the cash needs approach or the utility approach, as described in the AWWA Revenue Requirements Manual (M35)?
- YES__NO__Do you regularly review your water rates?
- YES__NO__Do you have a capital budget or capital improvement plan that projects future capital investment needs (at least five years) into the future?
- YES__NO__Do you have a process for scheduling and committing to capital projects?
- YES__NO__ Does your planning process account for all the potential capital needs suggested by all of the preceding questions in this manual?
- YES__NO__ Does your long-term planning incorporate analysis of different methods that might offer cost savings to customers, such as consolidation with other nearby systems or sharing operations and management expenses with other nearby systems?

Are current financial management mechanisms adequate?

YES___NO__ Does your water system presently operate on a break-even basis?
YES___NO__ Does it generate surplus revenue?
YES__NO__ Does the water system keep all the water revenues (i.e., water revenue does not support other municipal departments or unrelated activities)?
YES__NO__ Do you employ standardized accounting and tracking systems?
YES__NO__ Do you track budget performance?
YES__NO__ Do you have procedures for billing and collection?
YES__NO__ Do you keep records to substantiate depreciation of fixed assets and accounting for reserve funds?
YES__NO__ Are controls exercised over expenditures?
YES__NO__ Are controls exercised to keep from exceeding your budget?
YES__NO__ Are there purchasing procedures?
YES__NO__ Are there purchasing procedures?

PART III – BUDGETING WORKSHEETS

This section of the Business Plan includes four budgeting worksheets. Each worksheet provides space for budget data from the prior year, current year, and four years into the future. If you do not have access to historical data, fill in only what is known. However, it is important to be as complete as possible. Worksheet A is an expense budget, Worksheet B is a capital budget, and Worksheet C is a reserve budget. The first three worksheets (A, B, and C) lead into Worksheet D which compares total revenue sources with the total revenue requirement of the water system. Together, these four worksheets provide you with a tool by which you can project the future financial needs of the system and your availability to meet these needs -- or the system's financial viability.

Please note the instructions and explanations for the terminology used on the back of each worksheet.

WORKSHEET A - EXPENSE BUDGET									
			Prior Year	Current Year	Year 1	Year 2	Year 3	Year 4	
			Actual	Annual		•		-	
				Budget		Projected Budget			
1A	Exp	Denses							
2A		Personnel Costs							
3A		Utilities							
4A		Outside Services							
5A		Small Equipment, Materials, and Parts							
6A		Purchased Water							
7A		Chemicals, Treatment, and Monitoring							
8A		Transportation							
9A		Office Supplies							
10A		Customer Billing and Collection							
11A		Income Tax							
12A		Property taxes or payments in lieu of taxes							
13A									
14A									
15A									
16A									
17A									
18A									
19A		Depreciation (please see instructions)							
20A	1	Total Expenses (total lines 2A to 19A)	\$	\$	\$	\$	\$	\$	

WORKSHEET A - EXPENSE BUDGET

Expenses

Personnel costs. Enter the cost of salaries and benefits of the water system's operators and administrative employees.

Utilities. Enter the annual utility bill of the water system. Utilities include any power supply, including gas and electric, water supply, sewage treatment, and telephone/fax bills among others.

Outside services. Enter the total cost of any services that the water system hires another company or individual to perform. These services can include, but are not limited to, the provision of insurance, external auditors and other accounting services, legal services, architects, engineers, consultants, contractors, etc.

Small equipment, materials, and parts. Enter the total annual cost of any equipment, materials, and parts that are purchased to make repairs or otherwise maintain the water system. Only enter those items which will be paid for in a single year. Other items that have a long life (ten or fifteen years at a minimum), have a high cost that must be paid for over time, and are nonrecurrent should be added to capital outlays on Worksheet B.

Purchased water. Enter the total annual cost of any water that the water system purchases from other sources and then redistributes to the customers of the water system.

Chemicals, treatment, and monitoring. Enter the total annual cost of water treatment chemicals, other costs associated with treating the water, and the cost of monitoring water quality, including the cost of all monitoring and testing equipment.

Transportation. Enter the costs that the water system incurs for transportation-related expenses. Among others, these include the direct cost of vehicles and vehicle maintenance and repair.

Office supplies. Enter the cost of supplies that are used in administrative work. These supplies include paper, pens, etc.

Customer billing and collection. Enter the expenses that the water system incurs in sending out customer bills and collecting payments (do not include the associated costs of personnel nor outside services).

Income Taxes. Enter the amount of the water system's annual income taxes, if applicable.

Payments in lieu of taxes. Enter the value of any taxes paid on property or any payments made in lieu of taxes.

Other. Several blank lines are available to enter other expenses not included above that the water system may incur.

Depreciation Expense. Depreciation refers to the decrease in value of property, plant, and equipment over time. If it is not a practice of your water system to account for depreciation, leave the depreciation expense line blank. If it is a practice of your water system to account for depreciation and you contribute to a replacement/depreciation fund each year and the amount that you contribute is greater than or equal to your annual depreciation expense, leave depreciation expense blank. However, if you do not have a replacement fund or contribute significantly less to your replacement fund than the value of your depreciation expense enter your depreciation expense on Worksheet A.

Total Expenses. Enter the sum of all the expenses listed above.

WO]	RKS	HEET B - CAPITAL BUDGET						
			Prior Year	Current Year	Year 1	Year 2	Year 3	Year 4
			Actual	Annual			•	•
			Budget	Budget	Projected Budget			
1B	Ca	pital Outlays						
2B		New Capital Facilities						
3B		Renewal and Replacement Facilities						
4B								
5B								
6B								
7B								
8B		Total Capital Outlays (total lines 2B to 7B)	\$	\$	\$	\$	\$	\$
9B	Ca	pital Sources				-		<u> </u>
10B		Loan/Bond Proceeds						
11B		Equity						
12B		Contributions/Connection fees						
13B		Draw from Replacement Reserve						
14B		Grant Funds						
15B								
16B								
17B								
18B		Total Capital Sources (total lines 10B to 17B)	\$	\$	\$	\$	\$	\$
19B		T CAPITAL OUTLAYS (line 8B less line 18B)	\$	\$	\$	\$	\$	\$
20B	Ca	pital Financing				-		<u> </u>
21B		Principal, Interest, and Return on Equity						
22B								
23B								
24B								
25B		Total Capital Financing (total lines 21B to 24B)	\$	\$	\$	\$	\$	\$

WORKSHEET B - CAPITAL BUDGET

Capital Outlays

New Capital Facilities. Enter the sum of all costs that are associated with purchasing or constructing new facilities for the water system whose costs involve multiple-year commitments. These items may include the pumping station, distribution pipes, storage tanks, treatment plant, and other buildings and equipment.

Renewal and Replacement Facilities. Enter the sum of all costs that are associated with purchasing or constructing renewal or replacement facilities for the water system that involve multiple-year commitments.

Other. Several blank lines are available to enter capital outlays of the system that are not included in the two previous categories.

Total Capital Outlays. Enter the sum of the capital outlays listed above.

Capital Sources

Loan/Bond Proceeds. Enter the amount of money the water system obtains through borrowing, including bank loans, the issuing of bonds, etc.

Equity. Enter the amount of contributions that the water system receives in exchange for a right, claim, or interest in the water system.

Contributions/Connection Fees. Enter the sum of funds that the water system receives from construction assistance contributions or from the imposition of fees on the extension of services.

Draw from Replacement Reserve. Enter the amount of money that the water system used from its replacement reserve to finance capital projects.

Other. Several blank lines are available to enter capital sources of the system that are not included in the previous categories. **Include any grant funds that are received.**

Total Capital Sources. Enter the sum of the capital sources noted above.

Net Capital. Subtract total capital sources from total capital outlays. Ideally, the net capital of the water system should equal zero. The goal should be to balance the flows of capital outlays and capital sources. If the net capital figure is positive the water system has inadequate capital sources to meet its capital outlays. If net capital is negative the water system has more funds than necessary to finance capital improvements. It is important to note that in a given year net capital may vary significantly due to the timing of cash flows. For example, the year in which a large bond issue is made, to pay for a multi-year construction project, capital sources may outweigh capital outlays significantly.

Capital Financing

Principal, Interest, and Return on Equity. Enter the amount that the water system repays annually on all debt and equity incurred to finance capital projects, including both principal and interest payments.

Other. Several blank lines are available to enter other capital financing of the system that is not included in the previous category.

Total Capital Financing. Enter the sum of all capital financing of the water system listed above.

WORKSHEET C - RESERVES BUDGET									
			Prior Year	Current Year	Year 1	Year 2	Year 3	Year 4	
			Actual Budget	Annual Budget		Projected Budget			
1C	Res	erve for							
2C		Annual Installment							
3C		Running Balance							
4C		Target Balance							
5C	Res	erve for		•	-	-			
6C		Annual Installment							
7C		Running Balance							
8C		Target Balance							
9C	Res	erve for				-			
10C		Annual Installment							
11C		Running Balance							
12C		Target Balance					<u> </u>		
13C	Res	erve for		1	•	•			
14C		Annual Installment							
15C		Running Balance							
16C		Target Balance							
17C		TAL ANNUAL RESERVE INSTALLMENTS (total lines 2C, 6C, 10C, 14C)	\$	\$	\$	\$	\$	\$	
18C		TAL RUNNING BALANCE (total lines 3C, 7C, 11C, 15C)	\$	\$	\$	\$	\$	\$	
19C	TOT	TAL TARGET BALANCE (total lines 4C, 8C, 12C, 16C)	\$	\$	\$	\$	\$	\$	

WORKSHEET C - RESERVES BUDGET

Reserve for _____. Lines 1C, 5C, 9C, and 13C are available to enter the reserve accounts that the water system uses. Examples of reserve accounts include:

- · Operating Cash Reserve;
- · Replacement/Depreciation Reserve;
- Emergency Reserve; and
- · Debt Service Reserve.

The annual installment to the reserve account should equal the desired balance of the reserve divided by the number of years before that balance needs to be reached. The desired or target balance should be sufficient to replace depreciated equipment, address the worst emergency situation, or support the issuance of debt. The amount that is desired or targeted for future needs should be noted on lines 4C, 8C, 12C, and 16C. Also, denote the current running balance of each reserve account (on lines 3C, 7C, 11C, and 15C).

Total Annual Reserve Installments. Denote the total amount of money that the water system allocates to all reserve accounts annually.

Total Running Balance. Denote the total amount of money in all reserve accounts.

Total Target Balance. Denote the total desired or targeted balance of all reserve accounts.

WORKSHEET D – REVENUE ANALYSIS								
			Prior Year	Current Year	Year 1	Year 2	Year 3	Year 4
			Actual	Annual				
	_		Budget	Budget	Projected Budget			
1D								
	R	Revenue Requirements						
2D		Total Expenses (line 20A)	\$	\$	\$	\$	\$	\$
3D		Net Capital Outlays (line 19B)	\$	\$	\$	\$	\$	\$
4D		Total Capital Financing (line 25B)	\$	\$	\$	\$	\$	\$
5D		Total Annual Reserve Installments (line17C)	\$	\$	\$	\$	\$	\$
6D	T	OTAL REVENUE REQUIREMENT (total lines 2D to 5D)	\$	\$	\$	\$	\$	\$
7D		Number of Connections						
8D		(000's) Gallons Sold						
9D		Revenue Requirement per Number of Connections (line 6D/line 7D)	\$	\$	\$	\$	\$	\$
10D		Revenue Requirement per (000's) Gallons Sold (line 6D/line 8D)	\$	\$	\$	\$	\$	\$
11D								
	R	Revenue Sources						
12D		Rate Revenue						
13D								
14D								
15D								
16D	T	OTAL REVENUE (total lines 12D to 15D)	\$	\$	\$	\$	\$	\$
17D	B	SUDGET SURPLUS (DEFICIT) (line 16D less line 6D)	\$	\$	\$	\$	\$	\$
18D		Total Revenue per Number of Connections (line 16D/line 7D)	\$	\$	\$	\$	\$	\$
19D		Total Revenue per (000's) Gallons Sold (line 16D/line 8D)	\$	\$	\$	\$	\$	\$

WORKSHEET D - REVENUE ANALYSIS

Revenue Requirements

Enter the value of total expenses, net capital, total capital financing, and total annual reserve installments from the previous forms as noted.

Total Revenue Requirement. Together the items mentioned above encompass the revenue requirement of the water system. Enter the total of these items here.

Number of Connections. Enter the number of connections that the water system serves or expects to serve in future years.

(000's) Gallons Sold. In thousands, enter the total number of gallons of water the water system sells or expects to sell annually.

Revenue Requirement per Number of Connections. Divide the total revenue requirement by the number of connections.

Revenue Requirement per Thousand Gallons Sold. Divide the total revenue requirement by the gallons sold in thousands.

<u>**Current Revenue</u>** (NOTE: Future revenues are difficult to predict. Enter revenue values for years 1 to 4 only if the water system has the capability to accurately forecast these values).</u>

Rate Revenue. Enter the total amount of revenue that the water system collects through the levying of rates on water usage.

Other. Blank lines are available to enter other sources of revenue. These sources may include, but are not limited to, the following:

- Bulk Water Rates;
- Fire Protection; and
- Fees and Charges (bad check fees, reconnect fees, meter testing fees, late payment charges).

If the water system has more sources of revenue than available blank lines, group similar revenues together into broader categories and note these groupings for future reference.

Total Revenue. Enter the sum of all revenue collected by the water system.

Budget Surplus (Deficit). Subtract the water system's total revenue requirement from its total revenue.

Total Revenue per Number of Connections. Divide the total revenue by the number of connections.

Total Revenue per Thousand Gallons Sold. Divide the total revenue by the gallons sold in thousand

APPENDIX B

OPERATIONS & MAINTENANCE PLAN

(O & M Plan)

Guidance Manual for Preparing Public Water Supply System O & M Plans

MAY, 2000

Drinking Water Permitting & Engineering Program Georgia Environmental Protection Division 205 Butler Street, S.E. Floyd Towers East, Suite # 1362 Atlanta, Georgia 30334

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FOREWORD

The guidance and procedures outlined in this document are intended to supplement existing requirements. They do not replace the rules and regulations administered by the Georgia EPD. Nothing in this document intended to be more stringent than the regulatory requirements. The guidance and procedures herein are not an adjudication or a regulation. The guidance and procedures merely explain how and on what basis Drinking Water Permitting and Engineering Program of the EPD will administer and implement its responsibilities with respect to Operations and Maintenance Plans.

EPD reserves the discretion to deviate from the guidance and procedures in this document if circumstances warrant.

In the preparation of this part of the publication, EPD primarily used the technical guidance documents published by the Bureau of Water Supply Management of the State of Pennsylvania's Department of Environmental Protection. The following two technical guidance documents are used:

- Pennsylvania Department of Environmental Protection, Bureau of Water Supply Management, "Public Water Supply Manual, Part V-Section I and II - Operations and Maintenance (ID No. 383-3110-111)", November 1, 1997.
- Pennsylvania Department of Environmental Protection, Bureau of Water Supply Management, "Public Water Supply Manual, Part V (Appendix A) Operations and Maintenance for Small Groundwater Systems (ID No. 383-3110-211)", May 1, 1999.

OPERATION & MAINTENANCE PLAN OUTLINE

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INTRODUCTION

The purpose of this part is to provide assistance to the water supplier in the preparation and development of an Operation and Maintenance (O & M) Plan and the operation and maintenance procedures for each system. It is presented in three sections:

Section I contains the detailed guidance on how to prepare an O & M Plan for the system. Once an acceptable plan is in place, it becomes a reference book for the entire water system.

Section II contains detailed operation and maintenance procedures that can be used to assist the water supplier in preparing the O & M Plan. These detailed O & M procedures are provided as examples for describing typical facilities, and operations and maintenance procedures. This information can be used or adapted for use on any water system. However, the water supplier may want to develop customized procedures applicable to a particular process or system.

Section III is to assist the small ground-water systems in the preparation and development of an Operation and Maintenance (O & M) Plan.

SECTION I - PREPARATION OF AN O & M PLAN

Why is an O & M Plan necessary?

This plan should be developed by every public water supplier to provide a written source of material that can be easily referred to for guidance in operating a water system.

This plan will be a valuable reference tool for the operating personnel because standard operating procedures for the system and guidelines for start-up and emergency situations will beat their fingertips. The O &M Plan will also provide a ready reference for all equipment data which is necessary for performing normal maintenance and for ordering replacement parts and supplies. It will be an organized system for keeping records of the operation of the system. These records are useful for monthly and annual reports, as supporting documentation of proper operation, and to support the need for replacement or upgrading of treatment facilities. It will have detailed instructions for water sampling and testing which are required for compliance with the Safe Drinking Water Act (SDWA) and for routine monitoring of the treatment process for compliance with generally accepted good waterworks procedures.

The plan will contain information regarding start-up and normal operating procedures and emergency operating procedures; descriptions of equipment and facilities; organization responsibilities; names, addresses, and phone numbers of all key personnel; all contractors and suppliers; and state and local officials.

The O & M Plan will become a training manual to provide personnel with a handy source reference while they learn to operate the facilities. The O & M Plan will be used by experienced operating personnel to monitor normal procedures for changes or emergency conditions; as a source for names and phone numbers when emergency notification is required; and as a check of proper maintenance procedures.

How to Develop an Effective O& M Plan

O & M Plans are often prepared by engineers and managers; however, they must be certain that they obtain information from persons actually experienced in plant operation and maintenance.

The procedures must be described in terms and language which are readily accepted and understood by the operators. Because of the technical nature of the water treatment process, a basic level of knowledge and understanding by the operators must be assumed. The experienced operator will usually refer to the O & M Plan for confirmation of normal operation and maintenance procedures and as a reference guide for unusual operating conditions. The entry level operator should frequently refer to the O & M Plan for guidance and instruction,

Some water suppliers may have O & M Plans or certain parts of O & M Plans established for their system. These may include Emergency Response Plans, Safety Programs, Water Conservation Programs, Cross-Connection Control Programs, or other formalized procedures. This guidance manual

is not intended as a required format which must be followed, but as a presentation of procedures which can be considered for your use in the preparation of your O& M Plan.

Plans and programs which have been accepted as good, operating procedures can be directly included in your O & M Plan without rewriting; however, it would be a good idea to review and update your procedures.

Your O & M Plan will be a collection of plans and programs which will probably be stored in loose-leaf notebooks. The appearance of your plan is not as important as the availability of the information to the operating personnel and the ability to revise and update it.

How to Use Section I: Preparation of an Operation and Maintenance Plan

The chapters in Section I are organized in a simple and logical manner that can be followed in the preparation of an O & M Plan for a water supply system. Each chapter in Section I provides details of information which should be considered in the preparation of an O & M Plan.

The following is a brief look at what is in each chapter of Section I to help locate specific subjects and areas:

Chapter 1 - Description of Facilities

- The Owner(s) Who is responsible and where can they be contacted?
- The Service Area How far does the system extend?
- Permits What kind of permits and what are the conditions?
- System/Facilities Description Describes sources, treatment, pumping, transmission and distribution system, storage facilities, and other features of the system.
- Distribution Map What should a distribution map show?
- Flow Charts for Treatment Plants How to show the treatment process in simple terms.
- Pressure Gradients Pressure surveys and hydraulic gradients.
- Other Maintenance Requirements What is needed? What areas need help or equipment? This section suggests guidelines for major maintenance consideration.

Chapter 2 - Start-Up and Normal Operating Procedures

- Process Description This helps to understand the operating procedures.
- Relationship to Adjacent Processes How does each process work with the next process?
- Controls What controls each unit and what can be controlled?

- Start-up Procedures How to start up? What kinds of check procedures are needed? What is the sequence of start-up?
- Normal Operating Procedures What are normal operating procedures? What are the check points for normal operation? What are the minimum and maximum values of the checkpoints? What is the normal range of chemical dosages?
- Alternate Operating Procedures How does the plant operate when the normal conditions change, the raw water quality changes, or a process or piece of equipment is out of service? An alternate operation procedure is usually a planned change to accommodate major maintenance, increased demand, or use of an alternate source.
- Emergency Operating Procedures An emergency is thought to be sudden, unforeseen, or unexpected, requiring immediate action. A water supplier should anticipate that these conditions could happen and by having procedures established for those conditions, many emergencies become just alternate operating procedures. The water supplier is then able to continue safe, adequate service until the return to normal conditions.
- Common Operating Problems What kinds of problems regularly occur? What causes them? How can they be controlled or prevented?

Chapter 3 - Planned Maintenance Program

- Equipment Data Base Equipment Record Cards Used to record and document the maintenance history for each piece of equipment.
- Maintenance Procedures, Routine and Periodic.
- Work Order System The work order format and file system.
- Prioritizing Work Requests Planning and scheduling maintenance.
- Spare Parts Inventory Control.
- In-house vs. Contracted Labor.
- Manufacturer's Recommendations.

Chapter 4 - Records and Reporting System

- Types of Records.
 - Physical Plant Operation Regulatory Agencies Preventative Maintenance Operating Costs Personnel

Emergency Conditions

• Preservation of Records.

Chapter 5 - Sampling and Analysis Program and Compliance Monitoring

- Sampling and Analysis How to schedule the sampling. What are the criteria for sampling locations? Who collects samples and how do they handle them?
- Quality Assurance of Samples How to take the samples. What precautions are taken to prevent contamination of the sample? What are the time requirements for each type of sample?
- Compliance Monitoring Who checks if it is on schedule? Who interprets results? How are records kept?

Chapter 6 - Public Notification

- Regulatory Requirements for Public Notification Safe Drinking Water Act
- Content of Notification Information to be included and description of notice.
- Advance Preparations Media notification and direct notice.
- Sample Notices.

Chapter 7 - Staffing and Training

- Staffing Influences and task classifications.
- Job Descriptions How are job descriptions prepared?
- Organizational Staff Defines the responsibilities of each position.
- Certification Under Georgia law.
- Training Requirements Needs and availability.

Chapter 8 - Sanitary Survey Program

• Watershed Surveillance - Geology, sources of pollution, flooding.

- Evaluation of Source Protection, Intake Structures, and Transmission Facilities Facilities to evaluate, evaluation of hazards, evaluation of operating ability, condition of facilities, vulnerability of transmission mains.
- Treatment Facilities Inspection Raw and finished water quality review, condition and operating capabilities of components and evaluation of power systems.
- Finished Water Storage Facilities Capacities, sanitary protection, condition, and water quality.
- Distribution System and Pressure Surveys Water quality, unaccounted-for water, valve and fire hydrant program, and tabulation of pressure survey results.

Chapter 9 - Safety Program

- How to start and maintain a program Designate responsible person, form committees, and issue policy.
- O & M Safety Plan Identify hazards, develop safety manual.

Chapter 10 - Emergency Plan and Operating Procedures

- Emergency Plan and Operating Procedures Preparation Components, emergencies to be addressed, and emergency equipment hookup procedures.
- Evaluation Program Reviews and inspections, rehearsals/drills.
- Emergency Operating Procedures.
- Emergency Plan and Operating Procedures Outline (sample).

How to Use Section II: Operations and Maintenance Procedures

The chapters in Section II are presented to provide easy to follow examples of typical operations and maintenance procedures for a water system. This information should be readily adaptable for use in the O & M Plans of a large number of water suppliers. Some systems will not have all of the processes described and some will have other, more sophisticated processes. The water supplier may adapt those parts of this information they want and can use other sources for similar material. The following is a brief overview of what is in each chapter.

Chapter 1 - Sources of Supply

- Surface Water Quality, quantity, permits, treatment, watershed.
- Intakes Intake appurtenances, intakes on rivers and streams, silt removal operations and typical maintenance.

- Dams Types and sizes, regulation, emergency preparedness, O & M procedures.
- Wells Records, pumps, well bore maintenance, water quality.

Chapter 2 - Treatment

- Chemical Addition and Handling Coagulation and pH adjustment, taste and odor, corrosion, disinfection, fluoridation, and softening chemicals.
- Conventional Filtration Treatment Plant Rapid mix, coagulation/flocculation, sedimentation, solids contact units, filtration.
- Disinfection Chlorination, chlorine dioxide, other disinfection systems.
- Fluoridation Sodium fluoride, hydrofluosilicic acid, sodium silicofluoride, start-up, normal operations, chemical feed equipment, fluoride feed rates and records.
- Softening Lime-soda ash, ion exchange.
- Aeration Start-up, shut-down, normal operations, monitoring, records, maintenance, operation problems.
- Adsorption Powdered activated carbon, granular activated carbon.

Chapter 3 - Distribution

- Plans and Records Distribution system maps, pressure zones, updating and correcting plans, production and pumping records.
- Distribution System Transmission and distribution mains, valves, fire hydrants, blow-offs, records.
- Pumps Types of pumps, capacities and purposes, reports of operations and maintenance, monitoring operations.
- Distribution Storage Facilities Types of reservoirs and tanks, maintenance, safety protection, records.
- Unaccounted-for Water Basic calculation, normal operating ranges, control.
- Maintenance of Water Mains and Services Customer complaints, water main repairs, thawing of frozen mains and services.

Chapter 4 - Laboratory Equipment Maintenance

- Glassware, laboratory support equipment, analytical balance.
- Jar Test Apparatus Stirring machine, floc illuminator, beakers
- pH Meter Maintenance, calibration.
- Specific Ion Meter Maintenance, calibration.
- Turbidimeter Maintenance, calibration.
- Spectrophotometer Maintenance, calibration.
- Safety Equipment.

Section III - Operation and Maintenance for Small Groundwater Systems

This section is a summary of the chapters in Sections I and II which provides assistance for the water systems with a well, disinfection, distribution, and distribution storage. This will be useful to the small groundwater system which does not have engineering or management services available.

SECTION I - PREPARATION OF AN OPERATION & MAINTENANCE PLAN

CHAPTER 1 - DESCRIPTION OF FACILITIES

Chapter I presents key information needed to prepare a physical, operational, and legal description of a public water supply system.

1.0 Owner

- A. A description of the owner should provide the following information: operator (if not the owner), contact person(s), addresses, phone numbers, type of ownership, (e.g., private, municipality, authority).
- B. An organization chart indicating the chain of command should be included in this chapter.

1.1 Service Area

The service area needs to be defined both legally and physically. It may be defined legally for an investor-owned system; by municipal boundary for a municipal water system; or by an authority's articles of incorporation for a regional water authority. A map of the service area, scaled for a single page view or as a fold-out, as well as a view of the distribution network will be an adequate physical description of a small system. See Section 1.4 of this chapter for additional information for a distribution system map.

1.2 Permits

Water suppliers must be aware of the permits (including any standard and/or special conditions), laws, and regulations under which their system was built and operates. The O & M Plan for the facility allows the water supplier to integrate these documents into the recordkeeping system for easy retrieval. Copies of various documents may be included in a dedicated appendix or bound under separate cover and appropriately referenced. The section of the manual referencing the permits should have a listing of all permits issued, the facilities approved, dates the permits were issued, and the approved hydraulic capacities. It is important to note that any addition or modification to an existing public water supply will require the approval of EPD.

Primary permits include:

A. Permit to Operate a Public Water Supply System

- B. Permit to Withdraw Surface Water
- C. Permit to Withdraw Groundwater
- D. National Pollution Discharge Elimination System Permit (for establishment of effluent limitations regarding discharges of wastewater from drinking water treatment plants)

1.3 System/Facilities Description Provide general descriptions of:

- A. Sources of Supply
 - Surface source 1
 - A map of the watershed area indicating the drainage area in square miles, the а location of the water system facilities, and the names of major water sources.
 - b. Indicate the portions of the drainage area owned or controlled by the water system.
 - c. Indicate the allocated maximum / average daily withdrawal.
 - 2. Wells
 - Describe its location, diameter, depth, length of casing, depth of grout, static water a. level, pumping water level, pumping rate, date of installation, and any expansions or modifications.
 - Describe drainage area around well site, nearest source of pollution, well seal, and b. well enclosure.
 - Include well log, if available, and well driller's name. c.
 - d. Describe land ownership access and control.
 - Springs 3.
 - Describe location, capacity, enclosure, land ownership, access, and control. a.
 - b. Include date acquired and dates of any modifications.
 - Purchased Water 4.
 - List name of system, address, phone number, and contact person. a.
 - b. Date system connection was installed.
 - Describe mode of operation, such as emergency, intermittent, or continuous. C.
 - Describe pressure and volume (flow) normally received. d.
 - Describe any additional treatment or pumping required. e.
 - f. Describe meter (who owns and is responsible for maintenance) and valving. B-14

B. Treatment Process

1. General

Describe in general terms the treatment processes used at each facility. Include a flow diagram of the treatment facilities as part of this description.

- 2. Discuss each part of the treatment process separately with details of the component and its operation.
 - a. Intake or Raw Water Source
 - 1) Describe the control gates or valves including size and type of operation.
 - 2) Describe any bar screens or trash removal facilities.
 - 3) Describe any raw water pumps.
 - 4) Include dates facilities were installed and/or modified.
 - b. Chemical Additions
 - 1) It is probably best to describe each chemical addition as a separate process. Provide the name of the chemical applied, chemical formula and strength, name of chemical supplier, and type and size of containers. Indicate the type of chemical feeder, manufacturer's name, model number, maximum capacity, and normal range of feed rates. Describe where the chemical is applied to the water, what controls the dosage of chemical, and what tests are made to determine dosage.
 - 2) What are the safety precautions applicable to this chemical? What safety equipment is available?
 - 3) When were chemical feeders installed?
 - c. Rapid Mix
 - 1) What is the size, capacity, number of units, and construction of rapid mix chambers? What is the detention time at design flow rate?
 - 2) Describe the mechanical mixers, manufacturer, size, model, and speed.
 - 3) When were the mixers installed?
 - d. Flocculation
 - 1) What is the size, capacity, number of units, and construction of the flocculator chambers? What is the detention time at design flow rate?

- 2) Describe the mechanical flocculators, including manufacturer, size, model, and speed.
- 3) When were the flocculators installed?
- e. Sedimentation
 - 1) What is the size, capacity, number of units, detention time at design rate, and construction of the sedimentation basins? Are the basins baffled?
 - 2) Describe the mechanical sludge handling equipment. Are the basins drained and cleaned periodically?
 - 3) When were the basins installed?
- f. Filters
 - 1) Describe their size, capacity, number of units, type and size of filter valves.
 - 2) Filter media.
 - 3) Filter appurtenances, date installed or rebuilt.
- g. Clearwell
 - 1) Size, detention time at rated plant capacity.
 - 2) Is the clearwell baffled?
- h. Disinfection
 - 1) Describe the chlorine chemical, chlorine feed equipment, point of application, and maximum capacity of chlorinators.
- C. Major Pumping Systems Describe the purpose of each pump, size, capacity, rpm, manufacturer, model number, motor manufacturer, horsepower, motor frame size, location, suction and discharge piping size, and pressure controls. A copy of the pump performance curve showing the impeller diameter, the designed capacity, and head should be included with each pump description.
- D. Transmission and Distribution Systems Total system size (miles of pipe), number of service connections (or customers), and highlights of transmission line characteristics (main size, dates of original installation and expansions).
- E. Storage Effective capacity, maximum withdrawal rate, materials of construction, coatings, and altitude valves (i.e., how does the tank operate), and geographic location of reservoirs and elevated storage tanks.
- F. Other Alternative or emergency sources of water, shared utilities (e.g., power generating capabilities employed by others), and other unusual aspects of the system.

1.4 Distribution Map

If not already detailed in the definition of Service Areas, the supplier should have a detailed map of the system's transmission and distribution facilities. On a typical water distribution system map, each type of pipe can be identified with a number. This number may reference the plan number (since most systems require multiple plans). Additionally, valves and hydrants are identified and assigned identification numbers. Pipe sizes, year installed, and materials are identified alongside the pipe. Other pertinent information may be included to aid in the maintenance of the system.

While it is not necessary to show all of this information, it is a valuable planning tool for development or rehabilitation.

1.5 Flow Charts for Treatment Plants

Each treatment plant should be represented by a line diagram depicting flow of water through the facility. Major equipment and systems should be labeled on the chart. Although proper scale is not required, some attempt should be made to depict the plant in its actual layout

1.6 Pressure Gradients

A tabulation of the annual pressure surveys and hydraulic gradients for major transmission mains should be included.

1.7 Other Maintenance Requirements

Suppliers need to be aware of and document long-term maintenance needs such as five-year equipment inspections, tank painting, facility (such as roof) requirements, and routine items such as sludge disposal.

CHAPTER 2 - START-UP AND NORMAL OPERATING PROCEDURES

This portion of the O & M Plan discusses the normal operation of each treatment unit/process and provides guidance for alternate and emergency operations. The information provided in this section should address valve positions, capacities of each process, pump adjustments, and process control variables. Schematics and drawings should be used as part of these discussions.

2.0 **Process Description**

A well-written and prepared O & M Plan provides a means to understand the overall objectives of the treatment plant in addition to the immediate objectives of each process. In order to do this, the O & M Plan must provide detailed descriptions of the various treatment processes in the plant.

- A. The descriptions of the individual processes should follow the same order as the flow through the plant. It should contain information regarding the expected results or efficiency of each process and the anticipated operating parameters for each process. For example:
 - 1. Aeration used as a method for oxidation of iron and manganese and for the removal of hydrogen sulfide, carbon dioxide and volatile organic compounds through oxidation and stripping;
 - 2. Rapid Mix provides quick and thorough contact with chemical treatment aids prior to coagulation/flocculation;
 - 3. Coagulation/flocculation causes suspended and dissolved particles to "clump" together under the influence of chemical aids for easy removal;
 - 4. Sedimentation removes suspended or dissolved matter (turbidity) from water;
 - 5. Filtration removes suspended or colloidal particles from water as it is passed through the filter media;
 - 6. Disinfection destroys or inactivates harmful, disease-causing microorganisms;
 - 7. Chemical Addition/Handling utilizes various chemicals/equipment to enhance the treatment or quality of water;
 - 8. Fluoridation provides for the reduction of tooth decay in the general population. The addition of fluoride compounds to water is based upon local and state requirements;
 - 9. Softening removes dissolved magnesium and calcium compounds present as carbonate or noncarbonate forms.
- B. Provide a brief description of each unit within each process.

- 1. Identify the number of units available and state their operating or standby
 - 2. Provide a physical description of each unit including:
 - a. Dimensions length, width, depth, diameter;
 - b. Design loadings/capacities gpm, lbs/ft², gaIs/ft², etc.
 - 3. A description should be provided for each major component of a unit.
 - a. The description should reference the component's relationship to other components within the unit and should include:
 - 1) Functions;
 - 2) Limitations;
 - 3) Operating features;
 - 4) Component interlocks.

2.1 Relationship to Adjacent Processes

The operation of a process is made clearer by understanding the processes that both precede and follow it.

- A. Provide a general description giving type and function of preceding units and processes as they relate to the unit and process under consideration. This description should include the effects of inefficient operation of the preceding processes upon the process under consideration.
- B. Provide a general description, giving type and function of supporting processes as they relate to the process under consideration.
- C. Provide a general description, giving type and function of following processes as they relate to the process under consideration. This description should include the effects of inefficient operation of the process.

2.2 Controls

status.

The key to the proper operation of a process is understanding how to control the equipment variables as well as the process variables.

A. Describe methods of controlling each component of the process including any limitations to process operation.

Example:

- 1. Flow rates;
- 2. Chemical Dosages (List each chemical and normal dosage in lbs/day or mg/L);

3. Other.

2.3 Start-Up

Successful start-up of new or out-of-service facilities is dependent upon having a well-defined procedure to follow which details all steps involved. For example:

- A. Equipment Inspection
 - 1. <u>Physical:</u> The O & M Plan should include a procedure for performance of a physical inspection of all units.
 - a. All tanks should be checked for construction debris such as boards, concrete chunks, loose nuts and bolts, tools, etc.
 - b. All weirs, baffles, sumps, etc. should be checked for missing bolts, caulking, proper fit, defective protective coatings or other discrepancies which may affect the immediate or future operation of the unit or process.
 - 2. <u>Mechanical:</u> The mechanical inspection prior to start-up is extremely important for a smooth start-up and ensured operation.
 - a. The facilities manager should prepare a list of all gates and valves and indicate their proper position (i.e., open or closed). The inspection should verify the position and ensure the proper operation and seating of valves and gates. The position of gate stops should be checked at this time.
 - b. Piping should be checked to ensure that all test plates have been removed and that any pressure reliefs are properly sized and in place.
 - c. A listing of all motors should be prepared to guide a visual inspection for:
 - 1) Damage;
 - 2) Proper wiring;
 - 3) Obstructions which would interfere with operation;
 - 4) Proper mounting.
 - 3. <u>Electrical</u>: The electrical inspection of all systems prior to start-up is extremely critical. A large percentage of future problems can be eliminated by careful attention to detail at this stage of start-up.
 - a. All Motor Control Centers (MCC) must be checked for:
 - 1) Loose or disconnected wiring;
 - 2) Proper sizing of fuses and breakers;
 - 3) Properly-connected wiring.

- b. All controls/instrumentation must be checked for:
 - 1) Adjustment;
 - 2) Calibration;
 - 3) Operation;
 - 4) Electrical interlocks must be checked so the operation or non-operation of interlocked units is assured.
- B. Initial Preventive Maintenance

Prior to the operation of any motors or other mechanisms, a list must be prepared which details and verifies the lubrication, oil, and initial adjustments as recommended by the manufacturer's manual.

C. Operational Checks

After the preventive maintenance procedure is completed, an operational check must be performed for:

- 1. Proper motor rotation;
- 2. Operating mechanisms clearances (i.e., rubbing safety guards);
- 3. Chain and belt adjustments;
- 4. Scraper/skimmer operations for catching or binding.
- D. Safety Checks

After the operational checks, the safety features must be verified to ensure that:

- 1. All safety guards are securely in place;
- 2. All safety placards/warning labels are in place;
- 3. All specialized safety equipment is available and operable;
- 4. Operating personnel are familiar with safety equipment and procedures;
- 5. All chlorine monitors, where used, are operational;
- 6. Chlorine exhaust ventilation is operational;
- 7. Chemicals are properly identified and properly used.
- E. Equipment Adjustments
 - 1. Identify and verify all initial adjustments prior to operation of equipment.
 - 2. Provide for follow-up of adjustments after initial operation.
- F. Start-up Procedures
 - 1. Identify and verify sequential start-up procedures for each unit (for reference, see Section II, Chapter2 Treatment). Reference the operation of preceding units/processes.
 - 2. Sequential procedures must be listed in a Standard Operating Procedure (SOP).
 - 3. Influent water quality for each unit/process must be verified to ensure design loading is not exceeded. Water quality testing should include standards and procedures as noted in Chapter

5 of this section. Water quality requirements for a particular process should be noted in the SOP for the preceding process.

- 4. The Standard Operating Procedure should also indicate the start-up status of the process. For example:
 - a. The clearwell should be full of water at start-up. This water should meet the minimum water quality standards (i.e., turbidity, iron and manganese levels, chlorine residual, etc.).
 - b. Filters should be backwashed prior to being placed in operation (see Section II, Chapter 2 Treatment for explanation and description of backwash procedures).

2.4 **Operating Procedures**

A. Normal Operating Procedures

These will provide a description of the normal operation of each process. Each description assumes that the process is operating properly as designed and that all influent/effluent parameters meet the required standards. The following items should be included:

- 1. A general description of the process including schematics and related diagrams (see Chapter 1, Section 1.3 of this section).
- 2. A description of the influent water quality including any anticipated variations should be provided for each unit/process. The description should include average, maximum, and minimum conditions. Reference should be made for any sampling/testing procedures which are involved (see Chapter 5 of this section).
- 3. A description of all variables which may have an effect upon the unit/process operation. The maximum and minimum conditions should be indicated.
 - a. A description of process variables would include loadings and feed rates applicable to the unit/process.
 - b. A description of equipment variables would include speed settings, pump settings, etc. for the unit/process under consideration. Individual components must be considered in this description.
- 4. A description of valve positions related to normal operation (i.e., normally closed, normally open) of the process under operation.
- 5. A general description of the normal dosages of chemicals used in the process under consideration. The procedure should reference standard procedures for performance of tests (i.e., jar testing) to determine precise dosages (see Section II, Chapter 2 Treatment, for description of jar tests). Also describe the calibration and adjustment of test equipment to ensure accuracy (see Section II, Chapter 4 Laboratory Equipment Maintenance).

B. Alternate Operating Procedures

A description of major operating alternatives for each process should include an explanation of the purpose of each alternative and its effect, if any, on preceding or subsequent processes. This should include schematics and drawings, flow patterns, equipment operations, valving, and standby equipment.

C. Emergency Operating Procedures

A list of potential emergency situations such as power, well and water storage failure, equipment failure, loss of supply, toxic contamination, drought, loss of aeration, chemical or disinfection systems should be prepared (see Chapter 10 - Emergency Plan and Operating Procedures of this section).

- 1. A description of alternate power and power sources detailing the access to and operation of the source.
- 2. A description of the process with schematics and diagrams should indicate warning, interlock systems, and standby equipment.
- 3. A description of procedures for process bypass or shut down and the effects should be accompanied by schematics and diagrams.
- 4. An emergency notification list identifying who should be contacted by priority should include names, addresses, normal and alternate phone numbers, the reason for the notification and the type of information required (see Chapter 7, Section 7.2, and Chapter 10 of this section).

2.5 Common Operating Problems

A troubleshooting guide, both for mechanical and process, should be available to quickly identify common problems, probable causes, and a brief description of possible control or prevention techniques. Appropriate troubleshooting tables, for easy reference, should be provided in this section.

CHAPTER 3 - PLANNED MAINTENANCE PROGRAM

The objective of a planned maintenance program is to prevent unplanned, reactive maintenance. To accomplish this, the water supplier's staff must have a working knowledge of the equipment, its required maintenance, and the spare parts to be stocked.

There must be an effective system to inform the staff of the priorities and frequency of the maintenance which needs to be done. A record of the repairs made to each piece of equipment should be kept. This allows the manager to make appropriate judgements about the maintenance program, the quality and condition of equipment, and when replacement should be planned.

3.0 Equipment Data Base

This file, either computerized or manual, inventories each piece of equipment by assigning a unique number, describing its location in the system, and itemizing the details on its nameplate.

A. Equipment List - Individual pieces of equipment are numbered according to the facility they are associated with and their position in the process flow. The number becomes the equipment's identifier whenever maintenance is involved.

There are many numbering systems which can be used, from the very simple for small systems to very complex computerized systems for large systems. The purpose is to develop a system which is useful to the staff in identifying each piece of equipment for maintenance purposes.

B. Equipment Record Cards - Each piece of equipment is registered on a record card containing every feature about the unit. Where possible, this information is to be taken from the manufacturer's nameplate attached to the unit. Manufacturer's name, address, phone number, contact person, purchase order number, and/or contract number should be included. Additionally, equipment related to the unit, such as the drive motor and gear reducer, is added to the card.

Any O & M documentation, such as as-built drawings, manufacturer's manuals, etc., should be itemized and their file location noted. The equipment record card, normally a two-sided form, is used for noting the maintenance history of the unit.

3.1 Maintenance Procedures

All preventive maintenance procedures should be described in detail on a Maintenance Procedure Sheet for each type of unit. Where appropriate, complete details on the types and amounts of lubricants, hoses, packing, and other replacement items should be provided.

- A. Routine Procedures All routine procedures should be grouped together on a checklist according to their scheduled frequency. The procedures normally are scheduled for specific time periods so there is a uniform work load over the calendar year. All work should be done by persons who are qualified and knowledgeable in the operation and maintenance of the equipment.
- B. All maintenance procedures should conform to the manufacturer's recommendations to avoid cancellation of any warranties. Unusual use or environmental factors should be considered when establishing procedures (e.g., wet or dusty conditions would require more frequent maintenance).

3.2 Work Order System

All maintenance work should be documented. A work order system is one way to establish a permanent record of maintenance performed.

A. Work Order Format - The work order form should have the capability of:

- 1. Communicating a work request to the maintenance staff;
- 2. Authorizing repairs;
- 3. Planning repairs;
- 4. Receiving feedback in writing from the maintenance staff;
- 5. Documenting repair and cost history for the unit.
- B. Work Order File System Generally there is a backlog of work to be done by the maintenance staff. Work orders should be scheduled by several criteria:
 - 1. Location of repair;
 - 2. Necessary personnel;
 - 3. Time schedule Create a schedule for preventive maintenance work that can be phased in during the normal workload.
- C. Record of Completed Repairs Costs of labor and materials are charged against each piece of equipment. A history of repair costs provides information for capital improvement and maintenance budgets.

3.3 **Prioritizing Work Requests**

The following categories provide a simple, widely used method for prioritizing work:

- A. Emergency Catastrophic failure has or is about to occur which may be a hazard to the public or threaten the supply of potable water and may be dangerous to personnel. Work must be performed immediately. Notify EPD immediately. Around-the-clock work is authorized. Outside contractors are authorized.
- B. Urgent Failure that could affect the water quality, personnel health, or repair can greatly improve water quality. Generally applies to equipment which has no backup. Notify EPD. Overtime may be authorized. Outside contractors may be authorized.
- C. Important Water quality may be adversely affected or may damage equipment. Work should be planned preferably within two weeks. Notify EPD.
- D. Routine Desirable to repair, but not threatening equipment or water quality. Complete the work preferably within four weeks.
- E. Contingency Work Will extend life of equipment, will reduce cost of operation, and will improve water quality. Routine natured work should be scheduled according to work load, as a fill-in job for end of day or on those days when no work has a higher priority (should be completed within eight weeks).

3.4 Spare Parts Inventory Control

A. Inventory - The inventory requirements are generated primarily from equipment manufacturer's recommended spare parts lists, which are included with the O & M catalogs, from experience, and on the size of the water supply system. Budgeting for the spare parts inventory involves finding a balance between too much and too little inventory. Too much is

costly overhead, but too little can result in costly downtime. Good maintenance history records will greatly aid in making inventory decisions.

- B. Inventory Controls Since most small water suppliers can't afford a full-time storekeeper, a system must be implemented to protect the inventory from willful and accidental abuse. Generally, security must be left to the individual supplier's set of circumstances; however, stringent controls for documenting inventory transactions are necessary. The following are considered minimal procedures for inventory control:
 - 1. Spending authorization limits;
 - 2. A requisition procedure which provides order point/order quantity information, ties the requisition to a work order or need, and provides ample room for specifications;
 - 3. Posting and physical inventory procedures;
 - 4. Inventory monitoring procedures (total \$ and individual categories).

3.5 In-house vs. Contracted Labor

General guidelines for smaller facilities are as follows:

- A. In-house
 - 1. Routine Preventive Maintenance;
 - 2. General repair work of high priority equipment where down time isn't acceptable.

B. Contracted

- 1. Specialized skills for equipment required;
- 2. Large projects;
- 3. Seldom done, intricate work;
- 4. Specialized equipment.

3.6 Manufacturer's Recommendations

The manufacturer of each piece of equipment usually provides an operating and maintenance manual indicating the proper operating and maintenance procedures. A filing system for these manuals should be established so they can be easily located and used when necessary. The O & M Plan should include a reference section which will indicate the location and method of filing these manuals.

CHAPTER 4 - RECORDS AND REPORTING SYSTEM

Regular records and reports of the operation of water treatment and distribution facilities are helpful to those directly responsible for plant operations as well as municipal officials, consulting engineers, state and federal regulatory agencies, and others who have similar facilities and related problems. The water system operator can use these records as a guide in regulating, adjusting, and modifying the facilities and their operation. Another important function of record keeping is the establishment of reliable, continuing proof of performance for justifying decisions, expenditures, and recommendations. Such records are often the only sound basis for the water system to plan corrective measures for deficiencies in the water system or plant, or justify budgetary changes for expanding needs. Records may provide useful and valuable information to the customers served by the system and other groups and individuals in the community.

Operation reports also must be prepared for regulatory agencies responsible for monitoring the operation of water systems. Reports, which are sufficient for the water system's needs as well as those of the regulatory agencies, allow the water system and the technical staff of the regulatory agencies to determine the extent to which the objectives of water treatment are being met.

This chapter of the O & M Plan should stress the importance of the reporting and records maintenance program and should outline the types of records and reports that should be maintained, as well as how these records are to be kept.

4.0 Types of Records

The records which should be maintained for each water system will depend upon the system's size, complexity, treatment processes, etc. However, there are general types of records which should be maintained at all water systems regardless of complexity or size. Methods for maintaining each type of record should be developed and outlined in the O & M Plan.

A. Records of Physical Plant

Records of the existing physical plant and all the equipment included as part of the construction project should be maintained. This information is valuable to operating personnel in the day-today operation of the treatment facilities, to management personnel in scheduling services, to regulatory personnel in evaluating performance and compliance with standards, and to engineers and contractors in designing and constructing improvements and/or additions to the system. This information should be available to the operating personnel at all times and kept up-to-date and in a usable condition.

The O & M Plan should list the records of the physical plant to be maintained. These records may include record drawings and specifications of the water treatment plant and distribution system, the O & M Plan, manufacturer's literature, equipment description, and property deeds. The name and phone number of the plant design engineer should be included in the records. The engineer can help in answering any questions on the plant operation.

B. Records of Operation

Records of operation are necessary to provide an accurate description and ongoing account of water system operations. These records can be a valuable reference when the water system

operators are attempting to identify problems and determine corrective actions to be taken. The water system operating records are comprised of the results of tests, measurements, readings, and observations which have been made at various points in the water treatment and distribution systems, and of information related to other aspects of water system operation.

This section of the Records and Reporting System chapter of the O & M Plan should clearly outline the water system's operating records maintenance program and how it should be carried out. The following aspects of the maintenance program for records of operation should be incorporated into the O & M Plan:

1. Records to be Maintained

The operating records and reports, which the water system has determined must be maintained as part of an effective records maintenance program, should be listed in this section of the O & M Plan. Examples of typical records are flow records, chemical feed and inventory records, sampling records, pumping records, and physical/chemical water quality data records, etc.

The O & M Plan should also outline the scheduled hours, days, etc., when each of the required tests, measurements, meter or gauge readings, observations, etc., should be made and recorded (i.e., hourly, every six hours, daily, when a public notification is made, etc.).

2. Operating Record Sheets

Once a record keeping schedule has been established, operating record forms which will allow the records described above to be maintained in an organized, tabular form must be developed. The number, type, size, and complexity of the forms will depend on the complexity of the record keeping schedule and of the water system itself.

For example, a large water filtration plant with its own laboratory would need several large, daily operating record sheets with many entry points to accommodate all of the operating data collected in a single day. On the other hand, a small ground-water system may need only one or two simple monthly operating record forms to maintain daily operating records collected for an entire month.

The important idea is to develop forms which provide for the maintenance of all required records of the system in a usable and effective format. The O & M Plan should include copies of all operating record sheets, along with instructions for their completion. Electronic record keeping in place of completing paper forms may be used. If a computerized record keeping system is used, the system must be able to produce paper copies of the completed forms on demand, so reports can be submitted, if needed, to EPD.

3. Records Maintenance Responsibility

The O & M Plan should identify the person who is responsible for overseeing the operating records maintenance program so that employees will know who to approach with questions regarding the operating records.

4. Location of Records

The O & M Plan also should specify where the operating records are maintained so that anyone wanting to refer to them will know where to find them. Employees should be provided with instruction on all aspects of operating records maintenance for the water system. This section of the O & M Plan should stress the importance of keeping neat, clear, and accurate records. It should provide a handy reference of the required records to be maintained and should include copies of all record sheets, as well as instructions for their completion.

C. Records for Regulatory Agencies

Every water system must submit and maintain a variety of reports and records for a number of regulatory agencies, including EPD. In order to assure that the correct records are maintained for the required length of time required by the regulatory agency, it is important to include a section in the O & M Plan which outlines what reports and records are required by the regulatory agency and how long each record or report must be maintained. Guidelines for developing this section are as follows:

- 1. Safe Drinking Water Act Reports and Records: The requirements for reporting monitoring results, MCL violations, public notification, failure to monitor, enforcement actions, and emergency circumstances, etc.
- 2. Reports and Records for Other Agencies: The water system should find out from each regulatory agency to which it must report (i. e, surface water and/or groundwater withdrawal reports), exactly what reports and records must be submitted and/or maintained. These requirements then should be placed in an organized fashion into the O & M Plan.

A table or chart which summarizes all of the required reports and records, for which agency they are required, how often they must be prepared and/or submitted, and for how long they must be maintained should be prepared and inserted into the O & M Plan. It is also recommended to include where these records are to be maintained and who is responsible for maintaining them.

D. Preventive Maintenance Records

Preventive maintenance records are needed to provide accurate documentation of maintenance work or repairs that have been done on water system equipment. These records are valuable to the water system when selecting equipment in the future and for preparing maintenance budgets. The procedures for establishing the actual preventive maintenance program are discussed in Chapter 3 - Routine Maintenance Program.

The main objective of the preventive maintenance records section of the O & M Plan is to outline how the water system employees are to maintain records of preventive maintenance and repairs.

In order to prepare this section, the water system first must determine what components of the preventive maintenance program will be made a part of the water system records and list them in

the O & M Plan. These may include equipment records, records of repair and maintenance work, maintenance and repair cost records, and storeroom inventory records. Next, the method by which these records will be maintained should be developed and outlined. Two methods of preventive maintenance record keeping are the equipment data card method and the work order system. The equipment data card method registers information regarding each piece of equipment on one record card and maintenance history for that piece of equipment on a second card. The work order system is a method used to maintain accurate records of all repair work done on the water system facilities or equipment. The procedures for setting up these two record systems are outlined in sections 3.0 and 3.2 of Chapter 3. Record keeping systems which will maintain all other preventive maintenance records, such as storeroom inventory records and maintenance and repair cost records, in a complete, easy-to-use format should also be created. These may include record card systems, tables, and charts.

Once the preventive maintenance record keeping systems to be used have all been determined and developed, instructions for implementing them should be outlined, in detail, and placed in the O & M Plan. Sample copies of the equipment data cards, record sheets, tables, etc., which are to be completed by employees for records maintenance should also be included in the O & M Plan.

E. Operating Costs Records

It is important to maintain accurate records of water system operating costs because these records may be used to help plan future operating budgets, justify water rate increases, evaluate water system expenditures, and compare costs from one year to the next. Some operation and maintenance expenses for which operating cost records may be kept are costs for labor, power, telephone, fuel, process chemicals, equipment maintenance, capital improvements, metering, emergency repairs by outside repair services, and laboratory equipment and supplies. Records of administrative and clerical expenditures, such as billing services, legal fees, audit and engineering fees, insurance, social security, and labor costs also must be maintained.

An organized system for maintaining all of the water system's operating costs, expense record forms, or an expense record card system should be developed. The selected records maintenance system should then be described in the O & M Plan. A copy of all operating cost record forms and instructions should also be included.

F. Personnel Records

The water system should maintain an up-to-date record for each of its employees. The record should include the employee's name, job title, address and phone number, emergency phone number, date of hire, operator certifications and classifications, education, medical history, disciplinary actions, accident and injury records, and awards or commendations received. These records may be kept in a special card filing system or record book. The O & M Plan should briefly describe how personnel records should be maintained and should include a copy of the record card or form on which the records are to be maintained.

The O & M Plan also should include a list of the names, addresses, and phone numbers of all certified operators, their operator classifications, and the date of certification.

G. Emergency Conditions Record

Documentation of emergency conditions, as well as the actions taken in response to the emergency, is highly recommended. Such records will prove useful in updating and/or modifying an Emergency Response Plan as well as documenting problem areas for future construction projects. An Emergency Conditions Report should be compiled for each significant emergency or threatened emergency and filed into the water system records. For example, an Emergency Conditions Report for flooding of the treatment plant should include the following:

- 1. Time of notification of impending flooding;
- 2. Actual time flood water entered treatment plant site;
- 3. Measurement of highest water level in relation to physical structures at treatment plant;
- 4. Location where water first entered plant;
- 5. Equipment and/or structures damaged by flood. Was the equipment shut down? Record time and date;
- 6. Reports of maximum flood stage of the receiving stream;
- 7. Protective actions taken by plant personnel;
- 8. Other organizations or agencies contacted and actions taken;
- 9. Length of time and degree to which water quality was affected. Operators should record all customer complaints by date and time, and the follow-up actions;
- 10. Description of repairs and/or replacements required to restore plant to original condition. Record time and date of restoration of each unit;
- 11. Contractor, repair service, or equipment vendor involved in repairs/replacements, together with the individual who represented the company;
- 12. Cost of repairs/replacements;
- 13. Actions taken to prevent reoccurrence of emergency condition. Recommendations for revisions to emergency response plan and capital improvements.

This information could be necessary if insurance claims would arise as a result of a particular emergency condition.

When public notification is required, it is important from a legal and management standpoint that records of the notification are kept including dates of notification, procedures used to abate the condition, follow-up test results, and date notification advisory was lifted. Keep records of all correspondence, and all contacts with local and state agencies regarding the emergency situation.

Much of the information included in an Emergency Conditions Report also would be included in the operating reports. Instructions for completing an Emergency Conditions Report and incorporating it into the water system records should be included in the O & M Plan.

4.1 Preservation of Records

In order to prevent the destruction of records through loss from flood, fire, or other disaster, it is recommended that a program for the preservation of records be initiated and incorporated into the O & M Plan. The program should outline where copies of records are to be maintained to assure that, in the event that the original records are destroyed, a spare copy will still be on file. Some locations where the record copies may be maintained are with the system's consulting engineer, in the water system office or treatment plant, system managers' homes, etc. If electronic data storage is used, the O & M Plan should address the type and frequency of routine data back-up, location of the back-ups (not on top or beside the computer), rotation and replacement frequency of the back-up storage media (tapes, diskettes, etc.), data restoration procedures and the archiving of historic data. Off-site storage of routine back-up storage media and a back-up set of the software application used is strongly recommended. If the hardware used to access the electronic data is not easily replaced, measures should be taken to identify other facilities, businesses, etc. which could be used to run the software application and the electronic data system in the event the on-site computer was damaged, destroyed or stolen.

CHAPTER 5 - SAMPLING AND ANALYSIS PROGRAM AND COMPLIANCE MONITORING

One of the primary responsibilities of the public water supply operator under the Safe Drinking Water Act (SDWA) is the routine sampling and testing of the water quality. The sampling and analysis program also provides the basis for process control, produces a record of how the treatment facilities are operating, and helps predict problems that may be developing in the system.

This chapter of the O & M Plan should emphasize the importance of and outline procedures for properly scheduling, locating, and collecting samples, as well as obtaining reliable laboratory services and

qualified personnel. It also should address methods that the person responsible for overseeing the sampling and analysis program should use to monitor the program while verifying that the results are interpreted, reported, and recorded correctly. The result should be a sampling and analysis program which produces the most complete, reliable, and accurate results possible.

5.0 Sampling and Analysis

Sampling is the first step in any water quality analysis program; therefore, it is important to develop a sampling program which provides accurate representation of the quality of the water being tested or collected. This can be accomplished by scheduling sample dates, times, and locations so that they truly represent existing raw water, in-plant and distribution system conditions and by establishing proper sample collection, preservation, transportation, and storage techniques as part of a quality assurance program.

There are three basic types of samples which will be addressed in this section:

- Raw water samples;
- In-plant samples;
- Distribution system samples.

All are important components of a water quality monitoring program and, as such, should be incorporated into any O & M Plan.

A. Scheduling

1. Raw Water and In-Plant

In-plant sampling, as well as raw water sampling, is important for overall process control and for monitoring the various treatment processes. The operator should determine which samples should be taken at what points in the treatment process (see Section B.2) and at what frequency, based on the type and number of treatment units, volume of water treated, chemical additions, etc. A schedule for routine in-plant and raw water sampling then should be developed and included in the O & M Plan for quick reference. This schedule should be revised whenever a treatment process is added, deleted, or modified, or when unusual conditions or problems require additional sampling. The raw water and in-plant schedules also should be flexible enough to adapt to sudden changes in raw water conditions. such as sudden increases in turbidity due to heavy rains.

2. Distribution System

The O & M Plan should include a yearly-sampling schedule which clearly outlines what distribution samples should be collected and on what days to avoid confusion and to assure that the proper samples are collected and analyzed on time. Planning a sampling schedule and route also helps keep monitoring costs to a minimum by getting the work done with the least possible time and effort. The schedule also should identify sampling locations (see Section B), the person(s) responsible for collecting the samples, and any special instructions relative to a particular sampling technique. This information can then be entered into a Monitoring Plan.

The basic sampling schedule for each water supply will be determined largely by the routine monitoring requirements of the regulations. The sampling schedule, once established, should be updated annually to accommodate schedule or sampling location changes. Furthermore future amendments to the regulations will result in new monitoring requirements, including monitoring for volatile organics, TTHMs, HAA5s, disinfectant residuals and unregulated contaminants. Therefore, it is important for the water supplier to keep in contact with the EPD so that as the monitoring requirements are amended, the sampling schedule can be updated to reflect the changes.

The following factors should be considered when developing a sampling schedule:

- a. Following the minimum sampling requirements may not always provide an accurate picture of actual conditions in the system. In those cases, extra sampling and testing should be scheduled to improve surveillance capabilities. The actual number of these operational sampling points will depend on the specific characteristics of the system, as discussed below in Section B Location;
- b. Microbiological samples should not be scheduled for collection all in one day; rather, they should be spread out over the month so that the samples are representative of bacteriological conditions within the system during the entire month;
- c. Chlorine residuals should be taken concurrently with the microbiological samples;
- d. Coliform sample collection should not be scheduled for Friday. The laboratories would not begin the coliform analysis until Monday, and by then the sample would be too old;
- e. Schedule sampling so that samples which must be analyzed immediately are not delayed in transit while other samples are being collected.
- B. Location

Once the required type, number, and frequency of sampling has been determined, the specific location of sample points must be selected and incorporated into the O & M Plan. The main objective in sample point selection is to choose points which will provide samples that are truly representative of the type of water to be analyzed. This section outlines sample point selection guidelines for raw water, in-plant, and distribution system sampling and discusses how the selected sample point locations may be made into a meaningful part of the O & M Plan.

1. Raw Water Sampling

The selection of raw water sample points depends on the type of raw water to be sampled. The four general types of raw water and typical sample point locations are:

- a. Raw Water Transmission Lines From a Surface-Water Intake Samples may be taken directly from the main using a specially-installed sample tap located prior to any treatment;
- b. Ground Water (Wells) Raw water samples may be collected from a sample tap installed on the well discharge line at a point prior to any chemical additions or treatment processes;

- c. Streams or Rivers Samples must be taken at the point of intake far enough away from the bank to avoid dead spots or slow moving water. To prevent the collection of sediment or floating debris in the sample, a relatively deep point should be selected, resulting in the need to sample by wading or boat;
- d. Lakes or Reservoirs For samples being collected to determine the quality of water leaving the reservoir, the sample collection point should be located at the intake. To accurately sample the water quality in the reservoir, a number of samples must be collected at different depths and from different areas of the impoundment. In this case, sampling must be done from a boat.

Once selected, the exact locations of sample points should be included in the sampling schedule and should be sited on a map in the case of streams and reservoirs, or located on a plant or well house flow diagram in the case of a well or raw water transmission main.

2. In-Plant Sampling

Since treatment plants vary greatly as to the types, complexities and arrangement of treatment processes used, precise sampling locations must be selected on a case-by-case basis. Generally, in-plant sampling points should be established at any point where a measurable change in treated water quality is expected because of a treatment process or group of processes. Points may be selected to determine the efficiency of a specific treatment process and to assist in the identification of operational changes that could increase treatment efficiency or reduce operating costs.

For example, sample points located on the filter influent and effluent lines allow samples to be collected and analyzed for turbidity to monitor the turbidity removal efficiency of the filter. Also, sample points located prior to and following an ion exchange softener monitor the softener performance.

When selecting in-plant sampling points, the following precautions should be kept in mind:

- a. Points immediately downstream from chemical additions should be avoided, since proper mixing and reaction may not be complete by this point;
- b. Samples should always be collected from the mainstream of flow;
- c. Areas of standing water or with floating debris should be avoided.

In-plant sampling points, once selected, should be marked on a flow schematic diagram. Each sampling point should be labeled and assigned a number which corresponds to a number on the in-plant sampling schedule. The sampling schedule and diagram then should be inserted into the O & M Plan for easy reference. The diagram and schedule should be revised whenever a sampling point is added or deleted and, as a minimum, should be reviewed and updated annually.

3. Entry Point and Distribution System Sampling

Although distribution system sample point selection is somewhat judgmental, as a minimum, the points selected must be representative of each different source entering the system and of conditions within the system, and must be located according to the requirements of the SDWA. The required sampling locations for the various contaminants clearly are outlined in the regulations. This section will discuss factors to consider in the selection of representative sampling locations in the distribution system and specific sample points at those locations, as well as how they fit into an O & M Plan.

a. Sample Location Selection

The largest number of samples collected from the distribution system to test for total coliform bacteria, lead and copper tap, disinfection by-products and disinfectant residuals. The points selected for collection of these samples should be as representative of all sources as possible in accordance with the water system's Total Coliform Rule Sample and Lead & Copper Rule Siting Plans. Samples for inorganic and organic chemicals and turbidity, if surface water is used, are to be collected at the entry points to the water system's distribution system or at the combined filter effluent for the turbidity compliance monitoring.. Samples for radionuclides, and possibly asbestos as well as some organic contaminants if the system's infrastructure contains asbestos/concrete pipe, tank coatings, etc. which may be a source of contamination, are to be collected in the distribution system at representative locations.

The selection of the locations of the sample points is the responsibility of the operator. When selecting bacteriological sample point locations that will be representative of water quality in all parts of the system, the following factors should be considered:

- 1) Sample points should be uniform throughout the system;
- 2) Sample points should be located in loops as well as branches in the system;
- 3) There should be an adequate representation of sample points within each pressure zone;
- 4) Sample points should be located so that water flowing from storage tanks may be used as samples, rather than water flowing in the tanks;
- 5) For systems having more than one water source, sample points should be located in relative proportion to the number of people served by each source and should be representative of water from each source;
- 6) The locations of sampling points should be changed annually so that a better representation of system conditions can be achieved.

If the minimum required number of samples does not provide an adequate representation of the conditions of the system listed above, then additional sample points should be selected so that an accurate representation of water quality in all portions of the distribution system can be achieved.

b. Sample Point Selection

Once representative sample points have been located in the distribution system, specific sample faucets must be selected. These faucets may be located inside a

public building, at the home of an operator, or at the homes of the consumers. The following guidelines may be useful in the selection of sample faucets:

- 1) The faucets should be on lines connected directly to the main in houses supplied by short service lines (on the same side of the street as the main);
- 2) The selected taps should be the closest faucets to the point where the main enters the house. In some cases, this will be the front yard faucet;
- 3) Samples should be taken from the cold water faucet only;
- 4) Samples should not be taken from drinking fountains, swivel faucets, faucets with strainers, leaking faucets which permit water to run over the outside of the faucet, or houses with home water treatment units, including softeners;
- 5) Sample faucets which are dirty or are in areas with excessive dust, smoke, or other sources of contamination should be avoided.

Finally, once each representative sample point has been selected, it should be entered into the sampling schedule (or Monitoring Plan), along with a description of the location, and assigned a sample point number. Each point should be plotted on a copy of the distribution system map, along with the shortest route for each sampling frequency (i.e., daily route, weekly route, twice monthly route, or monthly route). This map then should be included in the O & M Plan.

C. Quality Assurance

The result of any analysis is no better than the sample used; therefore, proper sample collection, handling, preservation, transportation, and storage techniques are essential to a meaningful and useful monitoring program. Guidelines for carrying out these procedures correctly should be included as part of the O & M Plan so that they are available for reference by sampling personnel. This section outlines some suggested quality assurance guidelines for each aspect of the sampling process.

1. Sample Collection Techniques

Sample collection techniques vary for each type of analysis to be done. Prior to sampling, the laboratory performing each particular analysis should be contacted to obtain the proper sample bottles when needed or to verify sample volumes, special instructions, etc. Sampling techniques for some specific types of analyses are as follows:

- a. Bacteriological
 - A sterile bottle provided specifically for coliform sampling should be used. Sterilized, single-use plastic bags to which sodium thiosulfate has been added also may be used;

- 2) The bacteriological sample bottle never should be rinsed prior to the collection of the sample. Sodium thiosulfate is placed in the bottles by the laboratory to neutralize any residual chlorine in the sample;
- 3) Care should be taken so that nothing except the water to be analyzed will come in contact with the inside of the bottle or the cap. The bottle should be held approximately halfway from the top when being handled;
- 4) The outside of the faucet should be inspected. If water leaks around the outside of the faucet, a different sampling point should be chosen. The area also should be free of excessive dust, rain, snow, or other sources of contamination. The collector should avoid smoking while collecting the sample, since the smoke could contaminate the sample;
- 5) Avoid sampling from faucets with screens, aeration devices, or attached hoses;
- 6) The water should be allowed to run for sufficient time, generally two to three minutes, to permit clearing of the service line before the sample is collected so that the sample is representative of water flowing in the main;
- 7) When the bottle is being filled, it should be held so that no water which contacts the hands may run into it;
- 8) The bottle should be filled gently. A one-inch air space should be left at the top and the cap should be replaced immediately;
- 9) The free chlorine should be measured using a separate sample and all necessary field information should be recorded on the label provided with the sample bottle.
- 10) When sampling from a pond or stream, care should be taken when removing the cap not to touch the top of the bottle, since this could contaminate the sample. The bottle should be held approximately six inches under water and moved upstream away from the body.
- b. Chemical (Except Lead and Copper Rule First Draw Sampling)

The following outlines the method for collecting samples to be analyzed for inorganic chemicals:

- 1) Chemical bottles should not be rinsed if a sample preservation chemical (fixative) already has been added by the sample collector or by the laboratory which supplied the bottles.
- 2) If the chemical bottle does not contain a fixative, it should be rinsed with water from the source;
- 3) Care should be taken so that nothing except the water to be analyzed comes in contact with the inside of the bottle or cap;

- 4) The water should be allowed to run for sufficient time to permit clearing of the service line before the sample is collected, except when taking samples for corrosion end products such as lead or copper. In such a case, the sample should be collected immediately after the water is turned on;
- 5) The bottles should be filled carefully and a one-inch air space left at the top;
- 6) If a fixative was not added previously, it should be added after the sample is in the bottle;
- 7) For pond or stream sampling, the mouth of the bottle should be submerged and moved upstream away from the body with the bottle held halfway down from the top;
- 8) Each sample bottle should be labeled and marked with the appropriate information.
- c. Volatile Organics (VOCs)

Samples for volatile organic analysis (VOC) should be collected according to the following procedures:

- 1) A glass vial provided specifically for collecting a VOC sample should be used;
- 2) Prior to collecting the sample, the water should be allowed to run for two to three minutes to clear the service line and assure that the sample is representative of the water flowing in the main from the source;
- 3) Prior to collecting the sample, the flow rate from the sample tap should be reduced to make the sample collection easier and to decrease the turbulence which, in turn, reduces the amount of air in the sample;
- 4) Remove the lid from the vial, taking extra care not to dislodge the small, tefloncoated plastic seal (septum) from the lid;
- 5) Care should be taken so that nothing except the water to be analyzed comes in contact with the inside of the vial or cap. Also, the area should be well ventilated because fumes from cologne, gasoline, car exhaust, etc. can contaminate a VOC sample;
- 6) Fill the vial gently and full enough so that the water forms a curved surface (meniscus) above the rim of the vial;
- 7) Replace the lid carefully, being sure not to allow any air bubbles to be entrapped in the sample. Turn the sample upside down and tap the bottom of the bottle several times so that any bubbles will become visible. If bubbles are present, a new sample must be collected because the laboratory will not accept VOC samples with air in them. With time, the air reduces the levels of volatile organics in the sample, making it invalid;

- 8) Label each vial and mark it with the appropriate information.
- d. Chlorine Residual

The following procedure is to be performed with a portable DPD field chlorine residual color comparator test kit by the sample collector at the same time and location as the bacteriological samples. The orthotolidine (OT) method should not be used since it is no longer an approved method.

- 1) A representative sample which is separate from the bacteriological sample should be collected in the field test kit vial;
- 2) Agitation of the sample will cause a reduction in the sample's chlorine concentration and, therefore, should be avoided;
- 3) Exposure to the sunlight should be avoided because it, too, can reduce the chlorine concentration of the sample;
- 4) The chlorine residual test should be started immediately and the sample should not be stored because chlorine is unstable in water and residual chlorine diminishes with time.
- e. Lead and Copper (LCR) First Draw Sampling

The following outlines the method for collecting samples at a customer's tap to be analyzed for lead and copper:

- 1) A suitable 1 liter chemical sample container should be used to collect the firstdraw water after a minimum of a six-hour standing time. (Lead and copper analyses from sample sites that have had long standing times without use may have elevated results. Water suppliers can encourage a homeowner or other occupant of the sample site to flush the sample site prior to the required six hour standing time);
- 2) Samples must be collected at a cold-water kitchen or bathroom tap or an interior tap used for consumption and must be 1 liter in volume;
- 3) Care should be taken so that nothing except the water to be analyzed comes in contact with the inside of the bottle or cap;
- 4) If the sample is not acidified immediately after collection, sample must stand in the original container for at least 28 hours after acidification before it can be analyzed; and
- 5) Each sample container should be labeled and marked with the appropriate information.
- 2. Handling, Preservation, Transportation, and Storage

Since most samples cannot be tested immediately after collection, special attention must be given to handling, preservation, transportation, and storage to ensure that the levels of the contaminant remain unchanged until testing is performed. The following are suggested guidelines for each of these phases of the processing of a sample prior to analysis:

- a. The time interval between collection and analysis should be minimized as much as possible. The shorter the time between collection and analysis, the more reliable the results;
- b. The samples should be refrigerated or packed in ice at the time of collection to keep them cool until they are analyzed.
- c. Preservatives should be added to chemical samples to be analyzed for metals, hardness, and nitrates. These preservatives, as well as instructions for their addition, may be obtained from the laboratory which supplied the bottles or is to perform the analyses. The fixative should be added as close to the sampling time as possible. (Fixatives should not be used if they are cloudy or discolored);
- d. If direct access to a certified laboratory is not possible, a dependable method of shipment which will ensure the arrival of the samples at the laboratory prior to the expiration of the allowed storage time should be utilized. Usually a commercial package shipping service is the best way to ship samples for next day delivery;
- e. When shipping, bottle caps should be tight to prevent leakage. The samples should be packed in a sturdy container with enough cushioning material to prevent breakage;
- f. The amount of time a sample can be stored depends on the contaminant's stability and on whether a preservative can be added to slow down or stop changes.
- g. Samples for temperature, turbidity, and chlorine residual must be analyzed immediately after sampling by a sample collector who has been properly trained in the analysis procedures.

It is important that these sample handling procedures be included in the O & M Plan so that water system personnel responsible for collecting and analyzing samples have a quick reference available to them.

3. Monitoring Equipment

All monitoring equipment used to determine water quality parameters must be used, maintained and calibrated in accordance with the manufacturer's instructions. This includes in-line monitoring equipment such as turbidimeters, particle counters, and chlorine analyzers, and portable equipment used to measure pH, disinfectant concentration, and turbidity.

Turbidimeters must be calibrated a minimum of every six months. In-line turbidimeters must be disassembled and cleaned regularly as per manufacturer's instructions. It is important that the procedures for monitoring, equipment usage, maintenance and calibration be included in the O & M Plan.

D. Laboratory Services

The SDWA requires that all sample analyses to be used for determination of compliance with the monitoring requirements must be performed by a certified laboratory. Most water systems either use the services of the EPD's Water Laboratory, or have their own certified laboratories, or must retain the services of a certified private laboratory. In either case, the laboratory which performs the analyses must record the results on the proper standardized reporting forms which must then be submitted to EPD, in accordance with instructions provided by EPD, and to the water supplier within 10 days of the end of a monitoring period. A certified laboratory is also responsible for contacting a water supplier promptly (preferably within 1 hour), or EPD (preferably within 2 hours) if the water supplier cannot be reached, whenever an analysis finds a contaminant level which requires that check samples be collected or if an MCL has been exceeded. In addition, a certified private laboratory in the above mentioned situations must notify EPD in writing within 24 hours.

In any event, it ultimately is the water supplier's responsibility to assure that the proper samples are collected and analyzed, and the results reported to the proper parties in a timely manner. Therefore, regardless of who performs the sampling, analyses and reporting procedures, the operator should establish the sampling and analysis schedule, forward a copy to the laboratory (if a private laboratory is being used), and maintain a copy in the O & M Plan so that the entire sampling and analysis program may be monitored effectively. The name, address, and phone number of the responsible laboratory should be included in the O & M Plan. There also should be a detailed outline of the services which the outside laboratory is responsible for providing and what duties are the responsibility of the water supplier.

E. Personnel Requirements

For systems which do not retain the services of an outside laboratory for sample collection, the most important factors which will influence the number and qualifications of staff required to implement the sampling program are the number and frequency of samples to be taken and the size and complexity of the treatment processes and distribution system to be sampled. The sampling schedule discussed in Section 5.0.A can be used to estimate the work hours needed to collect all samples on schedule based on travel time to and from sample points and sample collection and preparation time.

Once the personnel are selected, it is important that they be trained in proper sample collection, preservation, and record keeping techniques (as described in Section 5.0.C). Refresher training in proper sampling techniques should be provided periodically to assure that correct procedures are being used.

The sampling schedule should include the name(s) of the person(s) responsible for the collection of each sample, as well as that of a backup sampler in the event of illness, etc. This will assure that all scheduled samples are collected on schedule. The O & M Plan should include minimum hiring standards and employee qualifications, as well as a training program outline for employees who will be responsible for sample collection and processing.

5.1 Compliance Monitoring

Once the samples have been collected properly and the analyses have been completed, the results of these analyses must be interpreted and decisions made based on these interpretations. Resampling may or may not be required, records must be maintained, and notifications to the EPD and water

system management may or may not be needed. This section will discuss how the person responsible for the monitoring of the water quality analysis program can include these aspects of the program into the O & M Plan.

A. Supervision

There should be one person responsible for overseeing and coordinating all aspects of the water quality monitoring program for the water system. The responsibilities of the program coordinator would include:

- 1. Development of sampling schedules, including the determination of the number of samples and locations of sampling points;
- 2. Assignment of sampling duties and routes;
- 3. Hiring and training of personnel;
- 4. Assuring that samples are collected and analyzed, and the results reported by the laboratory to the proper parties on schedule;
- 5. Maintenance of sampling and analysis records;
- 6. Interpretation of analysis results to determine what follow-up actions, if any, are needed;
- 7. Reporting, when required, to water system management and EPD;
- 8. Review, maintenance, and update of the sampling and analysis program section of the O & M Plan.

The coordinator should be thoroughly familiar with the regulations, as well as the monitoring and reporting requirements. A backup or assistant coordinator should be assigned and trained to assume the responsibilities of the coordinator when necessary. The following sections will outline in further detail record keeping, interpretation of results, and reporting as they relate to the responsibilities of the water quality analysis program coordinator.

B. Interpretation of Results

Once the water quality analysis results have been received, they must be reviewed to determine what, if any, follow-up actions are needed. When the analysis of a sample shows that an MCL has been exceeded, check sampling is required to confirm the routine sample results and to provide a safeguard against sampling or laboratory error. EPD also must be notified, as discussed in Section 5.1.C, as well as the appropriate water system management personnel. The program coordinator should be thoroughly familiar with these requirements so that prompt interpretations of the results may be made and appropriate actions taken when sample analysis results are received.

Although check sampling cannot be scheduled in advance, the coordinator should develop a plan which identifies courses of action to be taken when check samples are required. The check sampling plan should outline the person(s) responsible for taking specific check samples and

contacting the laboratory to schedule samples when necessary and should be placed in the O & M Plan. It would be helpful to include a list of the MCLs, for quick reference when laboratory results are being interpreted.

The water analysis program coordinator also would be responsible for the review of the results of the check sampling, along with the routine sample results, to determine compliance with the MCLs. When a violation occurs, the coordinator is responsible for seeing that the proper reporting and notification, as described in Section 5.1.C - Notification (Reporting) and Chapter 6 - Public Notification, are provided within the required time frames.

Finally, the interpretation of analysis results extends beyond determination of compliance with the regulations to the monitoring of the routine operation of the water system. It is, therefore, a key responsibility of the coordinator to see that <u>all</u> water analyses are reviewed and interpreted to identify any operation and maintenance modifications, changes in chemical feed points or rates, or additions or deletions of treatment processes that may be needed. To facilitate the interpretation of the in-plant sample results, guidelines outlining what type of problems particular water sample results could indicate and what actions may be taken to clarify or alleviate them should be included in the O & M Plan.

A typical entry could be as follows:

Sample location: Chlorine contact tank effluent.(entry point to the distribution system) Analysis: Chlorine residual. Analysis Results: Insufficient chlorine residual (<0.2 mg/L).

Possible Causes: 1. Malfunctioning chlorinator.

- 2. Increased chlorine demand due to high bacteria concentration.
- 3. Exhausted chlorine solution supply.

Recommended Actions: 1. Check chlorinator for the following and correct if necessary:

- a. Chlorinator is not operating;
- b. Loss of suction from chlorinator to chlorine solution tank;
- c. Incorrect feed rate setting.
- 2. Have raw water sampled and analyzed for total coliform, Increase chlorine dosage if coliform levels have increased.
- 3. Check chlorine level in the chlorine solution tank. Add solution if necessary.
- C. Notification (Reporting)

The water quality analysis coordinator, water operator in responsible charge, manager, or any other person designated by the water system should be responsible for assuring that all necessary notifications, both to EPD (and/or other pertinent agencies) and to water system management, are made within the required time periods. Issuance of notifications and reporting must be accomplished in accordance with the requirements stated in the Georgia Rules for Safe Drinking Water, Chapter 391-3-5.

The following steps are suggested:

a. Routine sample reporting

The results of any test required by the regulations must be reported within the first 10 days of the month following the end of the monitoring period, or within 10 days after they are received, whichever is sooner. This allows data for each month to be summarized and sent at one time, instead of submitting each individual test result immediately after it is received. It is the water system's (or the designated laboratory's) responsibility to report the routine sample results; however, the water system coordinator should follow up on the samples to confirm that the results have been reported on time.

b. Check sample and violation reporting

Generally, any sample result which exceeds an MCL must be reported to the EPD by the water system as required by the EPD, as must the results of check samples which confirm the presence of a contaminant. Furthermore, the supplier must report any failure to monitor to EPD within time period required by EPD and the Rules for Safe Drinking Water, Chapter 391-3-5. In all cases, public notification, which will be discussed in Chapter 6, also is required.

The O & M Plan should provide a handy reference to EPD's reporting requirements, as well as of the procedures to be followed to meet them, and should include:

- a, The name, address, and phone number of EPD and/or pertinent agency contact person;
- b. A flow chart for check sampling and reporting requirements for the system.
- 2. The management of the water system should be kept advised whenever circumstances require check sampling, EPD notification, or public notification. A water system policy on notification of management should be established and incorporated into the O & M Plan so that the proper action may be taken in any given situation. This policy should include:
 - a. A table or flow chart (or both) summarizing what situations require management notification, who should be notified in each case, and when they should be notified (i.e., prior to or following EPD notification);
 - b. The phone numbers, both home and office, of each person to be contacted.
- D. Record keeping

A procedure for maintaining accurate sampling and reporting records should be established and incorporated into the O & M Plan. All employees who are responsible for implementing the sampling and reporting programs then should be familiarized with the record keeping portion of the plan and provided with training on proper records maintenance procedures.

1. Sample Records

The following are some suggested guidelines for procedures on keeping accurate sample records which, in turn, may be included in the O & M Plan:

a. Each sample bottle should be assigned a number which corresponds to a number on a record keeping form that is maintained as a permanent part of the water system's records (see Chapter 4);

- b. Each sample bottle should be affixed with a label or tag which includes the following information:
 - 1) Sample number,
 - 2) Date sampled,
 - 3) Time sampled,
 - 4) Location sampled,
 - 5) Type of sample (i.e., initial, routine, check, raw water, treated water, special purpose, etc.),
 - 6) Sample collector,
 - 7) Preservatives used,
 - 8) Water temperature,
 - 9) Chlorine residual (recommended whenever coliform tests are taken),
 - 10) Date sent to lab;
- c. The information on the label then should be entered on the sample record form;
- d. A copy of a sample label, the sample record form, and sample record keeping instructions should be included in the O & M Plan.
- 2. Reporting Log

A reporting log also should be maintained to record all incidents which required some type of notification. This log should be maintained as a permanent part of the water system's records. Some recommended items to be included on the reporting log are as follows:

- a. Date of notification;
- b. Type of notification (EPD, management, public, etc.);
- c. Time of notification;
- d. Person contacted;
- e. How notification was made (telephone, in writing, newspaper, etc.). Copies of any written or published notification should be maintained in the permanent records;
- f. Reason for notification (failure to monitor, MCL violation, etc.):
 - 1) What, specifically, was reported,
 - 2) Response of the person notified (i.e., specific directions, advice, or instructions);
- g. Follow-up action (if applicable);
- h. Comments.

A sample copy of this log and instructions for its completion should be placed in the O & M Plan.

CHAPTER 6 - PUBLIC NOTIFICATION

One of the most important provisions of the Safe Drinking Water Act (SDWA) is the requirement that the water supplier notify its customers when the system is in violation of the regulations. Public notification is required to protect consumers from water that may be temporarily unsafe. If used properly, public notification also can increase public awareness of problems that the water system faces and the costs of supplying safe drinking water.

This chapter of the O & M Plan should serve as a guide to which the operator can refer for assistance in carrying out the public notification requirements. It should answer questions like:

- When is public notification required?
- What types of public notice are there and when is each type required?
- How will the amendments to the SDWA affect the public notification requirements?
- What information should be included in a public notice?
- How should a public notice be written?
- What preparations can be made in advance?

Sample notices for your system should be prepared and included as part of the O & M Plan.

6.0 Regulatory Requirements for Public Notification

The requirements for public notification for public water systems are clearly stated listed in Section 391-3-5-.32 of the Georgia 's Rules for Safe Drinking Water. These requirements also should be made a part of the O & M Plan.

6.1 Content of Notification

Since specific details of an actual public notice will vary depending on the circumstances, it is difficult to have specific notices prepared ahead of time and ready for use when needed. Therefore, it is important to have available all the information needed to prepare a notice when the occasion arises and to have some sample notices on hand. The basic elements of a good public notice should be outlined and placed in this chapter of the O & M Plan so that it will be readily accessible.

A. Information to be included

Generally, a public notice which fully informs users should include:

- 1. Who The name of the water system;
- 2. What The purpose of the notice (i.e., the violation, variance, or exemption);
- 3. When The date the violation was observed or the variance or exemption was granted;
- 4. Authority The name of the government agency (Georgia EPD) that established the regulation or granted the variance or exemption;
- 5. Regulation involved A description of the standard, such as the MCL for turbidity;
- 6. Health significance Mandatory EPA health effects language for the contaminants are to be used;
- 7. Precautions to be taken (i.e., boiling water, etc.);
- 8. Steps being taken to correct the problem A description of what actions are being taken by the water supplier to correct the problem (i.e., searching for an alternate source of supply);
- 9. Alternatives Where the customers can obtain an alternate supply of water if necessary.
- 10. Contact for Information List a name and telephone number for a water system staff person who can answer questions.
- B. Description of Notice

The regulations require that all notices to the public must be written in a way that informs users of the conditions in the system. They should conform with the following:

- 1. Public notices must be conspicuous They must not be buried in the newspaper where no one will notice them;
- 2. The language used must not be too technical Think of those who will be reading the notice and write it so that they will understand it;
- 3. The print must be easy to read Tiny print must be avoided, as well as lettering which might discourage readers;
- 4. Notices must be factual They must not be written in any manner that would slant public sentiment;

- 5. Notices shall include an explanation of the significance of the situation to public health, the steps being taken to correct the problem, safeguards and alternatives available to users, and the results of additional sampling. The notice can provide information regarding whether the water may or may not be used for drinking, cooking, washing dishes or clothes, bathing, watering plants, or feeding pets;
- 6. Where appropriate, bilingual or multilingual notices must be issued.

Some other suggestions for increasing the effectiveness of a notice are:

- a. The length of a notice is important A concise notice that states the facts is more effective than a lengthy report;
- b. The tone of a notice is important It should be written in a tone that avoids producing panic, anxiety, or confusion among consumers;
- c. Wording should be chosen carefully A notice that is perfectly accurate, if worded poorly, can cause alarm. To prevent this, an outsider or public relations specialist should be asked to proofread the notice. Content of the notice may require approval of EPD.

6.2 Advance Preparations

While public notices cannot be written ahead of time, some arrangements for issuing them can be made in advance and incorporated into the O & M Plan so when public notification is required, the process can proceed in a smooth and timely manner.

A. Media Notification

- 1. Television and Radio
 - a, Determine in advance what radio and television stations broadcast to the area served by the water system;
 - b Find out who the contact person at each station is and establish good communications. Inform them of the requirements, advise them of what would be involved on their part, and request information on what the water supplier would need to do in the event that public notification is required;
 - c. Assign one person to be the liaison with the television and radio stations. That person would be responsible for contacting the stations and assuring that the notices were broadcast correctly and within the appropriate time frames;
 - d. Include in the O & M Plan the name, address, phone number, and contact person at each of the stations to carry the notices, and note any special requirements or procedures to be followed for each one.

2. Newspaper Notice

- a. Determine in advance what newspapers are circulated in the water system service area.
- b. Contact the newspapers to establish communications, to familiarize them with the requirements, and to advise them of what would be needed in the way of space, print, and length of time the notice would need to be carried. Find out if they will accept notices as a news article and, if not, determine prices and procedures for printing an official public notice.
- c. Assign one person with the responsibility of seeing that the notices are published correctly and according to the regulations. That person should be responsible for maintaining contact with the press and keeping up to date on their requirements for publishing the notices.
- d. The O & M Plan should list the names, addresses, phone numbers, and contact people for the newspapers in which the notices will be published. Make a note of whether each notice will be published as a news article or will need to be paid for as a public notice. Also note any special instructions for each newspaper.
- B. Direct Notice

Since direct notice to the consumers is required under any circumstance, planning ahead is vital so that the notices can be written, printed, and mailed within the required time frames. Therefore, the O & M Plan should include:

- 1. A billing schedule, so that the determination of whether the notice may be sent with the next bill or whether it must be sent separately may be made;
- 2. Alternate methods of public notification if water bills are not mailed;
- 3. The name, address, and phone number of the company which will print the notices, as well as the name of a contact person at that company (if applicable);
- 4. Provisions for purchasing envelopes, typing mailing addresses on the envelopes or labels, stuffing the envelopes, and mailing the notices;
- 5. Because the direct notice can be in the form of a letter to the consumer, it can take on a more personal and informative note than media notification. Some items which can personalize a direct notice, as well as make it more informative, are as follows:
 - a. The notice can express the concern of the water supplier for the health and wellbeing of its customers by including an apology for any inconveniences, advising consumers to see a doctor if they feel ill, or providing information on where an alternate source of water may be obtained;

- b. Phone numbers of emergency services which can help the aged, infirmed, or disabled get water or obtain medical help may be given;
- c. The notice can provide information regarding whether the water may or may not be used for drinking, cooking, washing dishes or clothes, bathing, watering plants, or feeding pets.

CHAPTER 7 - STAFFING AND TRAINING

Even the best designed and constructed treatment facility will not operate at its full capacity without adequate numbers of qualified personnel to manage the processes. In order to plan the staffing of a facility, many things must be considered. Some of these considerations are the number and type of tasks to be performed, the skill level required for those tasks, prior training of personnel, certification of staff and training needs to upgrade skill levels.

7.0 Staffing

The numbers and qualifications of staff members will be determined by the size and complexity of operation of the facility.

- A. Influences
 - 1. Plant/System Layout: A plant/system which is compact in nature with centrallylocated controls will require a much smaller staff than a facility that is spread over a larger area.
 - 2. Processes/Degree of Treatment: Facilities with two to four processes will not require the staffing that six to eight would. A ground-water plant which treats for iron removal, hardness and disinfection will not be as complicated as one treating for iron and manganese, hardness, pH, tastes and odors, turbidity and color with disinfection.

- 3. Automation: A highly-automated plant may require less staff; however, they must be highly trained and more technically oriented (electricians, instrumentation technicians).
- 4. Contract Services: A facility which relies upon outside contractors may require less staff. Contracted laboratory services, electrical maintenance, instrumentation maintenance, etc., all will reduce the staff levels and may require staff with less technical capabilities.
- 5. Operations Schedules: A facility operating on a 24-hour/day, seven-day/week schedule will require four to five times the staff as a facility with an eight-hour/day, five-day/week schedule.
- B. Task Classification (Task classifications identify responsibilities and are broken down into the following general categories).
 - 1. Supervisory/ Management: Supervisors and managers provide the leadership and guidance for the overall operation of a facility. In general, managers plan the operation and supervisors put the plan into effect.
 - 2. Clerical: Clerks manage the data and record keeping of a facility.
 - 3. Laboratory: The laboratory staff performs analyses of water quality for various parameters from which decisions regarding plant operation are based.
 - 4. Operations: The operations staff provide the technical skills required to operate the equipment and processes of a facility.
 - 5. Maintenance: The maintenance personnel provide the skills required to keep the plant equipment in good operating order, and maintain a data base on equipment costs and repairs.
 - 6. Buildings/Grounds: The buildings and grounds personnel keep the buildings and grounds in good repair
 - 7. Distribution Maintenance:
 - a. Foreman
 - b. Equipment operator
 - c. Truck driver
 - d. Laborer
 - 8. Customer Service
 - a. Meter readers
 - b. Service personnel (set meters, shut off, turn on, investigate complaints, etc.)

In summary, even though a single staff member may perform more than one task or even all of

them, each separate task's responsibilities should be identified.

7.1 How Are Job Descriptions Prepared?

After tasks and corresponding qualifications are determined, the tasks can be assigned to certain position titles. The position description will discuss specific duties, supervisory, reporting, and performance level goals.

A. How are position qualifications determined?

Based upon the description of the position and the tasks involved, certain minimum experience, education and other qualities are necessary for entry level. Listed below are a number of factors which may be considered in determining the qualifications for a particular position.

- 1. Education (i.e., high school or equivalent, college or technical school)
- 2. General Abilities
 - a. Reasoning
 - b. Mathematical
 - c. Communication skills
 - d. Mechanical/Technical skills
- 3. Vocational Training
- 4. Interests
- 5. Physical Requirements
- B. What are the personnel sources?

Once the position descriptions are complete and the job qualifications are determined, the utility may obtain people to fill the positions. Primary sources of personnel are listed below.

- 1. Within the Present Organization
 - a. Promotion
 - b. Transfer
- 2. Outside Organization
 - a. Related Industries
 - b. Nonrelated Industries

7.2 Organizational Chart

The preparation of an organizational chart clearly will define the responsibilities of each position and will provide guidance as to whom to contact for help in emergencies.

- A. The organization chart clearly should demonstrate the lines of authority (solid line) and the support channels (dotted line). An organizational chart generally is made up of five major levels.
 - 1. Executive (Authority Board, Council, Commission)
 - 2. Upper Management (Utilities Director, Director of Public Works (Staff Support)
 - 3. Middle Management (Division Manager, Plant Manager (Staff Support)
 - 4. First-Line Management (Foremen, Supervisors)

5. Technical Workforce (Operations, Maintenance, Laboratory, Labor)

7.3 Certification

Water system operators must comply with the certification requirements of the Georgia's Rules for Safe Drinking Water, Chapter 391-3-5 (see Section .39).

7.4 Training Requirements

Well trained operations and management personnel are essential to the continued successful operation of any facility. Even the best designed and equipped facility will not operate without properly trained personnel. Training provides for compensation of deficiencies in skills and knowledge of entry level employees, remedies for performance deficiencies, and upgrading and/or retraining employees for new equipment, processes and techniques.

- A. Training Sources: A list of training sources available to employees should be prepared by the plant manager. These sources may include:
 - a. State/EPD sponsored training programs;
 - b. Local college training programs;
 - c. AWWA, State water associations (GWPCA, GRWA, etc.) training programs;
 - d. Private sponsor training programs;
 - e. Organizational (in-house) training programs;
 - f. Equipment manufacturer.

The list should include a minimum of the following information: Program description; course description; dates, times; and, contact person/organization.

- B. Training Needs: Prior to performing in-house training or recommending outside training programs, it is important that the training accomplish its purpose -- improve performance or expand skills. This training analysis is accomplished in three steps.
 - 1. Purpose
 - a. Improve performance;
 - b. Expand skills;
 - c. Correct deficient performance.
 - 2. Type
 - a. Technical
 - b. Management
 - c. Remedial
 - d. Orientation
 - e. Certification
 - 3. What goals should be met by training?
 - a. Set priorities
 - b. Establish controls
 - c. Provide a basis for evaluation

CHAPTER 8 - SANITARY SURVEY PROGRAM

A sanitary survey is an on-site review and evaluation of the water source, facilities, equipment, operation, and maintenance of the water supply system to assure the production and distribution of safe drinking water. Public water suppliers are encouraged to conduct an annual sanitary survey of their facilities. This is in addition to the scheduled sanitary survey conducted by EPD.

The water system should follow the sanitary survey format developed by the EPD so that the procedure covers all necessary components. The public water system may request a copy of the developed sanitary survey form from EPD for its use.

8.0 Watershed Surveillance

Watershed surveillance should look for existing and possible future health hazards for the purpose of protecting and maintaining the water quality. A systematic survey of the watershed will review the following areas:

- A. Geology, Topography, Vegetation, and Soils This review would cover any mining operations. Is the area forested or cultivated? Is soil erosion a problem? The water system should be aware of the extent and types of agricultural activities on the watershed;
- B. Sources of Pollution The nature, direction, and distance of all sources of local pollution such as the population density, the estimated number and type of animal habitat, and the amount of recreational use. This review will note all development and construction on the watershed;
- C. Sources of Sanitary Pollution All sources of sanitary pollution such as wastewater from individual residences (on-lot disposal systems), commercial, industrial, municipal systems, industrial discharges, and the disposal of solid wastes;

D. Surface-Water Flooding - Area for potential damage from surface-water flooding.

8.1 Evaluation of Source Protection, Intake Structures, and Transmission Facilities

- A. Facilities to be Evaluated Any structure or facility used in relation with the source of supply such as intakes, wells, dams, spillways, channels, and transmission mains should be listed and evaluated for hazards.
- B. Evaluation of Hazards All of these facilities should be evaluated for possible damage from natural or man-made hazards which could affect the water supply's ability to produce water. These hazards would include floods, ice, trash, debris, tree limbs, and logs.
- C. Evaluation of Operating Ability These facilities should be evaluated for their ability to operate at periods of low flow or drought.
- D. Condition of Facilities The condition of all facilities such as bar screens, trash racks, traveling screens, and sanitary seals at wells should be checked and any deterioration should be recorded.
- E. Vulnerability of Transmission Mains Long transmission mains should be evaluated for vulnerability at stream crossings, proper cover, any construction activities which could damage the pipe or conduit or change the conditions such as increasing or decreasing the amount of cover. The availability of alternate sources of supply or power, auxiliary power, and valve exercising programs should be included in this evaluation.

8.2 Treatment Facilities Inspection

- A. Raw Water Quality Review A review of the water quality tests should be made to determine if there is any change in the raw water quality which will affect the methods or cost of operation. This evaluation should be on the basis of annual and seasonal averages of values so that intermittent changes do not overly influence decisions.
- B. Finished Water Quality Review A review should be made of the finished water quality to evaluate the overall effectiveness of the treatment system. This evaluation should look at the average, maximum, and minimum values for the previous annual period, and determine if the water quality is improving or deteriorating. This should indicate the treatment system's ability to meet the safe drinking water requirements.
- C. Condition and Operating Capabilities of Components The review will evaluate the condition and operating capabilities of each component of the treatment process including the chemical feed equipment, rapid mix, flocculation, sedimentation, filtration, disinfection, and pumping. This section should determine each component's condition. Is it performing at its designed capacity? Has it been maintained according to industry standards? Does it require major maintenance or replacement?
- D. Evaluate Power Systems, Chemical Supplies The review will evaluate the adequacy of the available power system, standby power, and the record of power failures. Also, the reliability

of chemical supplies should be evaluated. Have there been shortages of chemicals? What are the minimum levels of inventory? Are there alternate chemical suppliers available?

8.3 Finished Water Storage Facilities

- A. List Capacities The review should list the capacities of all the storage facilities and make comparisons to the system's average day and maximum day demands. Do the storage facilities normally refill each day? Do any of the storage tanks go dry or low enough to cause low pressure during periods of maximum demand?
- B. Sanitary Protection of Facilities The review should check all of the sanitary protection features of. the storage facility. Are all of the storage facilities covered? Are the facilities vented and do they have overflows? Are all vents and overflow screens in good condition?
- C. Condition of Facilities The review should evaluate the condition of each facility (i.e., the paint system, the structural condition, concrete cracks and spalling). Is cathodic protection equipment operating and in good condition? Are fences, buildings, and pits in good condition? Are all valves operating? Is all level and pressure sensing equipment in operating condition?
- D. Water Quality In Storage A review should evaluate the quality of the water in and the water flowing out of the storage facility. Does the water have a chlorine residual?

8.4 Distribution System and Pressure Surveys

- A. Water Quality The review should evaluate the water quality in the distribution system. Is the chlorine residual at an acceptable level at all areas in the distribution system? Are there areas which have dirty water problems? There should be a review of all customer complaints regarding water quality and water pressure; areas of chronic problems should be noted.
- B. Unaccounted-for Water Percentage The review should record the history of unaccounted for water percentage and make comments about any changes and list the actions taken to reduce the percentage. The review should list the main and service repair history for the annual period and make specific comments regarding sections of mains and services which have a high rate of breakage.
- C. Valve and Fire Hydrant Exercising Program The review should comment on the effectiveness of the valve and fire hydrant exercising program. How many valves and hydrants were exercised and repaired? How many valves and hydrants remain inoperative?
- D. Tabulation of Pressure Survey Results The results of the pressure surveys should be tabulated and recorded. The pressure survey should include representative points, (i.e., the lowest pressure areas, the highest pressure areas, and the new main extensions). The results of the survey for each point should indicate the pressures at periods of maximum and minimum usage; and indicate the location and time of beginning and ending of each test.

CHAPTER 9 - SAFETY PROGRAM

Every water system, regardless of size, needs to develop and implement a safety program to prevent injury to its employees and to avoid accidents involving the public. The development of a safety program should include the preparation of a safety manual which provides employees with guidance on all aspects of the safety program. This includes information regarding potential job hazards, preventive safety measures, proper safety and emergency procedures for the use and operation of tools and equipment, and the proper methods of handling and reporting accidents and injuries. The safety manual, once written, should be included as a chapter of the O & M Plan and should be distributed to each employee.

The following chapter will serve as a guide to the development of a water system safety program, as well as for the preparation of a safety manual for inclusion in the O & M Plan.

9.0 Start-Up and Maintenance of a Safety Program

The process by which a safety program is established and implemented will differ for every water system. However, there are key elements which should be included as part of the start-up and maintenance of any safety program. Some of these key elements are suggested as follows:

A. Designate a Safety Officer

For large systems, a safety officer should be assigned; while in smaller systems, the manager or superintendent should assume the responsibilities of overseeing the safety program. The safety officer should possess a thorough knowledge of safety procedures and standards, and should be responsible for the development of safety programs for specific job activities and their incorporation into the safety manual. The maintenance of safety records and reports also would be among the responsibility of the safety officer.

B. Issue a Policy Statement

This statement should outline the water system's policy on safety and give its objectives concerning the employees' welfare. The objectives outlined in the policy statement can help the system gain the loyalty and respect of its operators and achieve efficient system operation. To be effective, the policy statement should stress the system's recognition of the need for safety and emphasize the responsibility of workers at all levels to perform the job safely. The policy statement should be included in the chapter on safety in the O & M Plan and reinforced by the supervisory staff.

C. Form Safety Committees

Safety committees are important tools in the development of a safety program because they enable different groups of people at different employee levels to meet and discuss safety issues as they relate to the various job responsibilities. Three possible committees are the management committee, working committee, and accident review board. The management committee can advise and assist management in the implementation of the safety program, while the working committee creates interest in safety within the work force. The accident review board would be responsible for the investigation and determination of accident causes. In smaller systems, one committee could be formed to perform the functions of these three committees with the superintendent acting as committee chairman.

D. Establish a Recordkeeping and Reporting System

A method of reporting and recording accidents and injuries must be established and maintained so that proper investigations can be made (i.e., the types, sources, and personnel involved in accidents and injuries recorded, and the causes determined). From these reports and records, corrective measures may be taken to prevent similar accidents or injuries in the future.

- 1. Safety Records and Reports: Some of the types of reports and records which should be incorporated into the safety program are:
 - a. Employee Record;
 - b. Occupational Injury Report;
 - c. Vehicle Accident Report;
 - d. Public Injury Reports.
- 2. Summary Reports: Summary reports for the safety program should be submitted by the safety officer to the supervisors and upper management on a quarterly basis and should be cumulative during the year. These reports should provide a summary of the occupational injury, vehicle accident, and public injury reports, and should compare the current year's data to the data from the previous year so that the effectiveness of the safety program may be evaluated. The method for preparing the summary reports may be included in the O & M Plan for easy reference.
- E. Institute a Safety Education and Training Program

The institution of a safety education and training program is needed to bring the importance of safety to the attention of the employees and to continually remind them of that importance. The program should include:

- 1. The development of a safety manual for all employees;
- 2. Conducting training sessions on all of the subjects covered in the safety manual;
- 3. Scheduling safety meetings, seminars, and talks to reinforce any safety training previously provided.

9.1 0 & M Safety Plan

As noted previously, the safety chapter of the O & M Plan also can serve as a safety manual for water system employees. It should be a compilation of the policies and procedures which have been established as part of the water system's safety program. Therefore, this chapter should include the water system's safety policy statement, the identification and description of water system hazards, a recommended safety program, accident and injury response and reporting, and fire prevention and first aid procedures.

The following sections will not outline the exact safety procedures that should be written in the O & M Plan. Rather, it will serve as a guide for recommended job activities for which safety procedures should be established and included in the O & M Plan, as well as other general topics related to the safety program that also should be included.

A. Introduction

The introduction to this chapter of the O & M Plan is a good place to include the water system's safety policy statement. In doing so, the system's policy on safety and the purpose of the chapter are clearly stated at the outset.

B Identification and Description of Hazards

The safety hazards associated with water supply systems are numerous and varied. Water system personnel should be made aware of all hazards, where these hazards are present in the water system, and how they may affect the employees. When writing the safety chapter of the O & M Plan, emphasis should be placed on the hazards within the specific system for which the plan is being written. The following list identifies some of the general hazards faced by water system employees. The O & M Plan should include a similar list which identifies the specific hazards of the system for which the plan is being written.

- 1. <u>Water Treatment Plant, Well, or Booster Pump Station Hazards</u>. In a water treatment plant or in water pumping stations, the most common safety hazards are the following:
 - a. Bodily injury caused by falls, improper lifting, improper use of tools and equipment, and moving mechanical equipment;
 - b. Electrical shock and burns;
 - c. Drowning;

- d. Injury caused by improper chemical handling;
- e. Exposure to chlorine gas;
- f. Laboratory accidents;
- g. Injury caused by improper entrance into confined spaces.
- 2. <u>Distribution System and Storage Tank Hazards</u>. In a water distribution system and in storage tank facilities, the most common safety hazards are the following:
 - a. Bodily injury caused by falls, improper lifting, improper use of tools and equipment, motor vehicle accidents, automobile traffic at work sites, improper pipe handling and improper trenching and shoring;
 - b. Exposure to dangerous gases;
 - c. Electrical shocks and burns.

This section of the safety chapter of the O & M Plan also should include a detailed description of each hazard, including where each hazard may be present and what the health risk from each hazard may be to the employee.

C. Recommended Safety Program

Once the job hazards have been identified and described, it is important then to outline the proper safety procedures which should be used when performing each job task to reduce these hazards as much as possible. Therefore, this section of the safety chapter of the O & M Plan should provide detailed safe operating procedures for specific aspects of water system employee job responsibilities. Recommended safety procedures for each of these water system job tasks can be found in the American Water Works Association's (AWWA's) Manual M3, Safety Practices for Water Utilities, latest edition, as well as in other reference materials on water supply system operation. Additional excellent references are the Chlorine Institute for chlorine safety, and OSHA which provides general safety information and safety sheets for chemicals used in the water industry. Manufacturers' literature also may be a good source of safety procedures for some of the tools, equipment, and machinery used by the particular water system for which the O & M Plan is being written.

The following sections discuss some of the recommended job-related activities for which safety procedures should be provided in this section of the safety chapter of the O & M Plan.

- 1. <u>General Safety Practices and Equipment</u>. Safe work procedures for all jobs performed by the water system employees should be established and standardized if the maximum benefits of the safety program are to be obtained. Some general topics of safety practices and equipment are:
 - a. Personal Protective Equipment. The type of personal protective equipment required for each job activity should be outlined. When the wearing of personal protective

equipment is specified, it should be made mandatory. The types of personal protection equipment that should be discussed are:

- 1) Face and eye protection;
- 2) Hand protection;
- 3) Body protection;
- 4) Head protection;
- 5) Foot protection;
- 6) Respiratory equipment;
- 7) Safety belts.
- b. <u>General Safety Procedures</u>. There are some activities that, even though they are performed routinely, can result in serious injury if not carried out in the proper way. Therefore, the correct procedures for lifting and lowering objects, fall prevention, and the use of stairways and handrails should be outlined in the O & M Plan.
- 2. <u>Use of Tools and Equipment</u>. It is important that the need for learning and using the proper care and handling of tools and equipment be stressed in this chapter. By establishing safety procedures for all tools and equipment used by water system personnel, some serious accidents and injuries may be avoided.
- 3. <u>Motorized Vehicle Operation</u>. In order to avoid as many motor vehicle accidents as possible, it is important that:
 - a. The employees who are responsible for operating each vehicle are made aware of and trained in the proper operation of the vehicles;
 - b. The vehicles are properly maintained according to the manufacturers' recommendations.

Therefore, the O & M Plan should include procedures for the safe operation of each motor vehicles driven by water system employees. It also should include a safety checklist which lists items that should be checked prior to operation of the vehicle (e.g., headlights, turn signals, horn, windshield wipers, mirrors, brakes, etc.). The employees should be provided with training in the safe operation of the vehicles and periodically evaluated on safe driving skills.

- 4. <u>Distribution System and Storage Facilities</u>. To reduce the distribution system and storage facility hazards outlined in Section 9.1.B.2.b, employees should be provided with the proper procedures for performing the job activities related to working in the distribution system and storage facilities. Some of the job activities for which safety procedures should be included are:
 - a. Entering and working in confined spaces;
 - b. Trench excavation;
 - c. Blasting operations;
 - d. Barricades and warning signs;
 - e. Pipe handling, installation, and storage;
 - f. Climbing, entering, and repairing storage tanks and standpipes.
- 5. <u>Water Treatment Plant, Well, and Booster Pump Stations</u>. The purpose of this section of the safety chapter is to inform the employees who are responsible for working in and around water treatment plants, well houses and booster pumping stations of the proper procedures for

performing job activities in these areas. Safety precautions should be outlined for maintenance work on treatment units, pumps and related equipment, placement of equipment guards, and working on or near electric switch panels.

Employees should be instructed to refer to the applicable sections of the safety chapter for special instructions on electrical safety and chemical handling. Some areas for which safety procedures for treatment plant and pump station personnel are as follows:

a. Electrical Safety

Although water system operators should not be performing major electrical repairs or installations, there are times when minor repairs or routine inspections are needed. Also, since much of the equipment routinely used by the operators is powered by electricity, as are most of the water system facilities themselves, it is important for the employees to be well informed on the proper procedures for working with or around electrically-powered tools or equipment. The electrical safety guidelines for electric hand tools and electric equipment should be included in the safety procedures for the specific pieces of equipment to be used for each job.

This section of the O & M Plan should outline preventive measures which must be taken to ensure the safety of the operators while they are performing maintenance, installation, or inspection of electrical systems in the water treatment plant, in well or booster pumping stations, or in the distribution system. It also should outline safety precautions to be taken when working with or in the vicinity of electrically-powered tools or equipment.

In distribution systems, electrical hazards (when excavating) must be stressed due to the current practice of buried electrical lines. Locations of underground utilities must be obtained prior to excavation.

When changing water meters, care must be taken to provide an electrical continuity across the meter space because the residential wiring systems may be grounded to the water system and the water system employee could receive a severe shock.

b. Chemical Handling and Storage

Water supply system personnel are responsible for handling a variety of chemicals, the nature of which depends on the complexity of the water system. In a simple well system, hypochlorite solution may be the only chemical used; while in a complex filtration plant, chemicals used can range from lime and alum to powdered activated carbon and gas chlorine. Regardless of the size or complexity of the system, it is important that the employees responsible for handling chemicals are well informed and thoroughly trained in the proper handling and storage procedures for all chemicals used in their particular water treatment process.

When preparing the chemical handling section of the O & M Plan, each chemical used by the water system in any capacity -- from water treatment to window cleaning - - should be included.

The following information should be provided for each chemical:

- 1) Safety hazards posed by the chemical;
- 2) Special precautions to betaken;
- 3) Proper handling procedures and storage methods;
- 4) Protective equipment;
- 5) Control of leaks (for liquids and gases) and dust (for powders);
- 6) First aid and emergency procedures.

As previously stated, the proper safety procedures for all chemicals used by the system should be included in this section of the O & M Plan. If any chemicals are added to or deleted from the treatment schematic, the manual should be revised to include or delete that chemical.

A separate section of the safety chapter, preferably the section immediately before or after the chemical handling section, should be devoted to the Right to Know Act. This section should outline the requirements of the act and the water system's responsibilities as a result of its enactment. The following section provides an outline of how the Right to Know section of the O & M Plan should be written.

c. Right to Know Act

The purpose of this law is to ensure that information concerning the hazards of all chemicals is transmitted to employees who must work with them so as to reduce the incidence of chemically-related illnesses and injuries. In other words, workers have a right to know about chemical hazards to which they may be exposed. This is to be accomplished by providing information about chemical hazards to the water system employees by the following means:

- 1) Labels. Labels must be placed on each container present in the work areas and should list precautions in the following categories:
 - a) Basic warnings;
 - b) First aid;
 - c) Fire;
 - d) Spills;
 - e) Handling and storage;
 - f) Disposal.
- 2) Material Data Sheets. A material safety data sheet (MSDS) or similar informational reference for each hazardous chemical used must be maintained in each work place. These material safety data sheets must be made available to the employees during all hours of operation. The material safety data sheets must contain information for each hazardous chemical in the following categories:
 - a) Chemical identification Chemical name, trade names, manufacturer's name and address, and an emergency phone number;

- b) Hazardous ingredients What harmful ingredients the chemical contains and safe exposure levels;
- c) Physical data Describes the chemical's appearance, odor, and other characteristics;
- d) Fire and explosion data Identifies temperature at which the chemical ignites (flash point) and what will extinguish the fire;
- e) Health hazards Lists symptoms of overexposure, first aid and emergency procedures in the event of overexposure, and medical conditions that may be aggravated by exposure to the chemical;
- f) Reactivity data States whether the chemical reacts with materials or conditions:
 - Incompatibility Lists materials that cause the chemical to burn, explode, or release dangerous gases,
 - Instability Lists the environmental conditions, such as heat or direct sunlight, that cause a dangerous reaction;
- g) Spill or leak procedures Outlines what method to use to clean up a spill or leak, required protective clothing and chemical disposal method;
- h) Special protection Lists any personal protective equipment needed to work safely with the chemical;
- i) Special precautions Lists any other special precautions to follow when handling the chemical and any health and safety information not covered in other parts of the MSDS.
- 3) Employee Information and Training. The water system must provide employees with information and training on hazardous chemicals in their work areas. This training must begin before the employee's initial assignment and additional training shall be provided when new chemicals are used or new information indicates the need for additional protective measures. The training programs should be conducted during the employee's regular working hours. The information and training program shall include the following:
 - a) Provisions of the act;
 - b) Discussion of operations in the work area where hazardous chemicals are present;
 - c) Methods of detecting the presence or release of hazardous chemicals in the work area;
 - d) The location and availability of the written hazard communication program and related documents;
 - e) Protective measures the employees may take, including the purpose, proper use, and limitations of personal protective equipment;
 - f) Explanation of labeling system and material safety data sheets;

- g) Emergency procedures, methods, and observations that employees can use to detect the presence of a hazardous chemical.
- 4) Access to Written Records and Prohibited Practices. All chemical identification lists and material safety data sheets required by the act and any exposure measurements taken to monitor employee exposure to chemicals in the work area must be made available upon request to any affected employee or former employee, authorized employee representative, designated physician or representative. Furthermore, it is unlawful for the water system to discharge, discipline, or otherwise discriminate against any of its employees who assist in the enforcement of the act.

As stated previously, the safety chapter of the O & M Plan should include a section which outlines the requirements of the Right to Know Act as it relates to the water system and it employees. This section should include the information provided above so that employees are aware of the provisions of the act and of the obligations that the water system has to its employees under the act.

d. Laboratory Operations

The water system employees who work in the laboratory also face job-related hazards because they must work with glassware; toxic, hazardous, and flammable chemicals; corrosive chemicals; acids; alkalies; and bacteriological agents. As a result, the inclusion of correct procedures for safe laboratory operations in the safety chapter of the O & M Plan is vital for laboratory worker safety. The laboratory safety section of the chapter should include safety guidelines related to the following activities:

- 1) Handling and cleaning of glassware;
- 2) Chemical handling guidelines for chemicals used in the laboratory;
- 3) Personal protection equipment;
- 4) Correct use of pipettes;
- 5) Proper use of laboratory equipment, including hot plates, water stills, centrifuges, etc.;
- 6) Personal hygiene;
- 7) Use of the laboratory safety equipment listed in Section 11, Chapter 4 Laboratory Equipment Maintenance.
- 6. <u>Office Worker Safety.</u> Since the purpose of the safety program is the elimination of all hazards, regardless of where they exist, safety guidelines should be established for water system office employees and incorporated into the safety chapter. Some areas of concern which should be considered when preparing the office safety measures include wet or newly waxed floors, aisles and stairs, doors, adequate lighting, electrical safety, proper material storage, office fans, fire extinguishers, emergency plans, chairs, file cabinets, and proper use of off ice equipment (i.e., staplers, paper clips, scissors, etc.).
- 7. <u>General Maintenance</u>: Water system maintenance involves some hazardous job responsibilities. Therefore, the proper procedures for performing some of the more hazardous maintenance duties at the water supply system should be outlined in the O & M Plan. Some of these

maintenance duties include window cleaning; cleaning, scrubbing, and waxing floors; and painting.

- 8. <u>Fire Protection</u>: Methods for the protection of the water system and employees from fire hazards should be included in this chapter of the O & M Plan. This section should include information regarding:
 - a. Fire prevention measures Include guidelines on housekeeping activities that relate to fire prevention, such as proper disposal of cartons, crates, trash, etc.
 - b. Fire extinguishers Include number of extinguishers, types, locations, installation, inspection and maintenance requirements, and the type of extinguisher used on each type of fire (i.e., foam-type extinguisher on a Class B (flammable liquid) fire).
 - c. Flammable storage Outline proper storage methods and instructions on where and how flammable materials and chemicals should be stored.
 - d. Telephone numbers of fire and police departments.
- Accident and Injury Response and Reporting. Because accidents do sometimes happen even when safety procedures are followed, the safety program also should include a section which provides guidance on procedures which should be followed in the event of an accident or injury. This section should include procedures on accident response, first aid, and accident and injury reporting,
 - a. Accident Response

Prepare instructions on procedures to follow when an accident happens (i.e., who should be notified, administration of first aid and reporting requirements). Include telephone numbers of the safety officer and/or supervisor, fire department, ambulance, police department, physician, and poison center.

b. First Aid

All employees should be encouraged to become trained in the administration of first aid and cardiopulmonary resuscitation (CPR) and advised of where such training is available. In addition, emergency first aid procedures for different types of injuries should be outlined in this section of the safety chapter. Some injuries for which emergency procedures should be provided are exposure to dangerous gases, electrical shock and burns, bodily injury, drowning, injury caused by dangerous chemicals, and miscellaneous first aid measures.

A good reference for first aid procedures for all of these injuries is the American Red Cross First Aid Textbook, which may be obtained from local Red Cross offices.

c. Accident and Injury Reports

An important part of the success of the safety program is an established accident and injury reporting program. An accident and injury report should be developed and a copy of the form, as well as instructions for completion, should be included in this section of the O & M Plan safety chapter. Employees should be provided with instructions on when and how the form should be completed.

CHAPTER 10 - EMERGENCY PLAN AND OPERATING PROCEDURES

The Emergency Plan and Operating Procedures (EPOP) differs from the Emergency Response Plan (ERP) primarily in the degree of detail provided. The ERP provides general information in dealing with emergency situations (i.e., power failure, hurricane or severe storms and floods). For example, in the event of a power failure, the ERP will describe action to be taken which may include contact with the power company, phone numbers and contact persons, location of and access to emergency power generating equipment or emergency pumping equipment. The EPOP, however, will include further details such as specific instructions on how to hook up the generator unit to the motor control center or how to hook up the emergency pump. These instructions will include names of persons trained in the procedures, special equipment, tools or fittings which may be required and their locations.

The EPOP will also address emergency operating conditions. The operating condition might be one of bypassing a particular process for maintenance or repair (e.g., filter units). The EPOP will address the effect this operation will have on the overall water quality, as well as the effect upon both upstream and downstream processes.

The EPOP will continue with instructions as to the means of minimizing any deleterious effects upon overall water quality. These instructions may include additional chemical treatment of upstream or downstream processes, additional process monitoring and/or testing requirements, and use of any special equipment required to accomplish the above (i.e., portable chemical feeders, mixers, etc.). The EPOP also will refer to any specific operating procedures contained elsewhere in the O & M Plan.

Finally, the EPOP will address any safety hazards related to a particular incident and should include identification of the hazard, procedures to correct or otherwise deal with the hazard. special equipment required, and emergency medical notification.

10.0 Emergency Plan and Operating Procedures Preparation

The first step in preparing an Emergency Plan and Operating Procedures is to determine the potential for process or equipment failure, power failures, natural disasters, and loss of supply. This information should be available in your Emergency Response Plan. This analysis results in a priority list of emergency situations from which the Emergency Plan can be based.

- A. List Major Emergency Situations The first step in preparing an EPOP is to list all major emergency situations that have been identified in the Emergency Response Plan. These will probably be the following:
 - 1. Distribution System Problems;
 - 2. Equipment Failure;
 - 3. Disinfection Failure;
 - 4. Power Outages;
 - 5. Loss of Supply;
 - 6. Contamination of Supply;
 - 7. Strikes;
 - 8. Vandalism and Sabotage.
- B. Select and Discuss the Emergency Situation The second step in preparation of the EPOP is to select the emergency situation to be addressed (e.g., power failure, equipment failure, or bypass, water contamination (toxic spill), drought, and process failure).
 - 1. Estimate the effect of each emergency situation upon each system component. For example:
 - Emergency situation -power failure at well field;
 - System component well pumps;
 - Effect total loss of water supply.
 - 2. Evaluate the system's capability to perform during the selected emergency. For the example given in B.1, an auxiliary power supply source is available and there are no alternate water sources. The capability of this system to perform under this situation depends upon the utilization of the auxiliary power supply.
- C. Identification and Description of Procedures to be followed.
 - 1. Develop a detailed description of the procedures for each of the emergency situations. The EPOP continues with a detailed description of the procedures used in hooking up the generator to the motor control system. Specifically, is the hookup a simple "plug-in" operation or does the generator have to be wired to the motor control center? If so, the EPOP will identify the proper terminals to be wired including a wiring diagram. Further, safety hazards (shock, electrocution) are identified and safety equipment/procedures are listed.
 - a. Preventive Maintenance Program
 - 1) Identify electrical tasks recommended by manufacturer
 - 2) Prepare Standard Maintenance Procedures
 - 3) Develop preventive maintenance schedules
 - b. Testing Program
 - 1) Develop regular test procedures for:
 - a) Switch gear,
 - b) Generators.

- 2. Consider the following when developing these procedures:
 - a. Flexibility of operations Provide by-pass diagrams/procedures -- spare tankage equipment and spare filters;
 - b. Provide adequate chemical inventory to meet needs for an extended period:
 - Provisions for alternate chemicals Calcium or sodium hypochlorite, chlorine dioxide,
 - Disinfection alternatives/application points Spare chlorinators, portable hypochlorite feed equipment;
 - c. Staff training Review the emergency operating procedures with staff and hold periodic emergency exercises/drills;
 - d. Adequate tools and equipment List special tools or repair kits needed and where located;
 - e. Identify interconnections (size, location, flow, pressure, etc.) and equipment needed to complete the interconnection;
 - f. Identify emergency equipment inventory:
 - Within the organization,
 - Purchase/rental services,
 - Contractor owned;
 - g. Identify person(s) responsible for implementing the emergency operating procedures and persons trained for specific tasks/procedures.

10.1 Emergency Evaluation Training Procedures

The manager should have all operating procedures defined in such a manner that a person(s) would be able to operate all processes and equipment with only a basic familiarity with the system.

Example - In the event of employee strike/walkout, illness, injury, death, etc, engineers or alternate outside personnel would be able to operate the facilities with only general supervision.

Also as part of the 0 & M Plan, the manager should establish a program with local fire, police departments, and regulatory agencies to provide basic knowledge of the facilities. For example:

- A. Periodic Reviews/inspections
 - 1. Fire/chemical hazards/prevention
 - 2. Security measures
- B. Rehearsals/Drills
 - 1. Fire, explosion, personal injury

2. Chemical release

10.2 Emergency Plan and Operating Procedures Outline (Sample)

- A. Anticipated Emergency Situations and Possible Solutions
- B. Emergency Operating Procedures
- C. Assessment of Equipment Available

D. Provisions for testing the emergency plan and follow-up improvements and adjustments SECTION II - OPERATIONS and MAINTENANCE

PROCEDURES

CHAPTER 1 - SOURCES OF SUPPLY

The sources of supply for a water system may be a surface-water supply, a ground-water supply, or water purchased from another water supplier. Surface-water supplies consist of rivers, streams, lakes, or impoundments. Groundwater supplies can be wells or springs.

A water system may have a single source or multiple sources. Water systems with multiple sources have greater reliability and are less vulnerable to accidents, power interruptions, and potential pollution incidents.

1.0 Surface Water

A. General

Surface water is obtained from rivers, streams, lakes, or impoundments and is, therefore, subject to pollution by upstream users on the watershed. These sources of pollution may be as simple as on-lot sewage disposal and recreational use of the watershed, and as great as an industrial discharge or the discharge from a large municipal wastewater treatment plant.

B. Quality of Water

The quality of the water available may determine the selection of a source by a water system. For example, a community may be located next to a river which has a high level of pollution; therefore, the community may look for alternate supply sources, drill a well, connect to another public water system or develop a surface source away from the river to obtain a better quality water.

C. Quantity of Water

The amount of water that can be withdrawn from a particular water source must be coordinated through the EPD's Water Resources Branch.

D. Permits

Permits are required by EPD for withdrawing water from sources of supply. An application must be submitted to the EPD's Water Resources Branch to obtain a Permit to Withdraw Surface Water.

E. Treatment

The methods of treating surface water range from direct filtration or microfiltration to conventional filtration complete coagulation/flocculation/sedimentation filtration, and may even include softening and activated carbon filtration. All surface water sources are required filtration and disinfection treatment prior to use. Approval of the engineering plans and specifications must be obtained from EPD's Drinking Water Permitting and Engineering Program prior to construction of the water treatment facility.

F. Watershed

The watershed area above a surface supply controls the quantity and quality of water available to the water supplier. The water supplier must know the limits and all possible sources of contamination on the watershed.

1. Land Management

The water supplier should exercise control over all land which is owned and particularly those areas which are close to the source of supply. A procedure for routine patrol of the area should be established where large areas of watershed are owned. There should be policies to limit the access and recreational use of the area. These policies are usually enforced by posting signs and installation of fences. These should be checked and maintained on a regular basis.

- a. Water supply reservoirs may experience watershed conditions which may affect the quality of the water. Major storms may result in serious erosion of the watershed which could cause silting of the reservoir and turbidity in the water. The turbidity is of serious concern due to the possibility of bacteriological contamination.
- b. Watershed management programs can be effective for controlling silt loadings, turbidity levels, nutrient loading, and organic loading in water supply reservoirs. A watershed management program must be tailored to the specific watershed and be technically and economically justifiable. Preventing these contaminants from entering the water supply will result in lower costs of maintenance, longer periods between dredgings, lower costs of operation, less chemicals needed for treatment, and a better quality water for the customer.
- c. The methods of watershed management are removal of trees, brush, and growths from areas to be flooded. Decomposition of this material will consume oxygen and release nutrients into the water.
- d. Other watershed contamination problems

- 1) The contamination of the watershed due to bacteriological and nutrient loading of the water supply can deteriorate the water quality to the point where it is not economically feasible to treat the water. Then the source of supply must be abandoned.
- 2) Fertilization of crops and landscaping by materials high in nitrogen can cause quantities of these nutrients to be carried into the water supply reservoir. Phosphate-based fertilizers do not cause this problem since the phosphates tend to bind with the soil and remain there.
- 3) Industrial discharges can cause many serious problems for a water supply. These discharges are controlled by EPD. Careful coordination between the water supplier and EPD is necessary. Also, discharges from mining and oil or gas exploration can cause serious erosion problems and may result in the discharge of hazardous materials.
- 2. Lake Management

Operating and maintenance procedures should be established to control access to the lake or impoundment for boating and fishing. There must be responsible use of the facilities to prevent contamination of the water, prevent littering, and provide for disposal of sanitary wastes. Where recreational use of water supply dams and lakes is permitted, the responsibility for administering the program usually is delegated to other agencies. The water supplier should periodically survey the water supply for silt buildup which will affect the capacity and could interfere with the intake of water.

a. In shallow lakes, the growth of algae may be a problem. There should be a treatment procedure to prevent this growth. The growth of algae is stimulated by nutrients such as phosphate, nitrate, and organic nitrogen compounds.

The growth of algae can cause taste and odor problems, shortened filter runs, increased pH, dissolved oxygen depletion, and increased organic loading. These conditions require special treatment procedures to assure the production of a quality water meeting the requirements of the Safe Drinking Water Act.

Sometimes lakes and impoundments become stratified into thermal layers or zones. These thermal layers, because of differences in temperature and specific gravity, will mix the zones which is called a turnover. This mixing of the thermal zones causes an increase in biochemical oxygen demand (BOD) which causes a dissolved oxygen depletion. This condition is evidenced by large amounts of decomposed algae cells in the water which will have a hydrogen sulphide odor (rotten eggs) and iron or manganese sediments in the water, giving it a "dirty" water appearance which may cause staining on laundry. When these conditions exist, the operator should attempt to take water at different levels to obtain the best quality available. Proper treatment should be provided to supply acceptable water to the customer.

- b. The treatment of lakes and impoundments by chemicals is primarily used to control plankton and aquatic growths. This prevents taste and odor problems and reduces bacteriological contamination. Make sure that the chemicals used is acceptable for use in domestic water supplies. One of the most common algicide used is copper sulphate pentahydrate (CuS0₄-5H₂0). It is either used by itself or in conjunction with other chemicals.
- c. Another treatment method used for lakes and impoundments is reaeration. This is the introduction of air through forced air diffusers on the bottom of the lake. The fine air bubbles rise through the water which replenishes the dissolved oxygen and causes the lower levels of water to rise to the surface. This prevents stratification of the water and exposes more water to the atmosphere where oxygen is transferred to the water. The reaeration reduces algae bloom, increases the dissolved oxygen in the water, and prevents the stratification of the water.
- d. Keeping records of water levels and water quality is a very important aspect of lake management. The water level is important if the water supplier has control of the impoundment since he/she must be concerned about the quantity of water available for water supply uses, for release to the streams to maintain flows according to permit conditions, and for maintenance of the water level for preservation of the recreational and environmental conditions.

Records of the watershed yield will enable the operator to predict the amount of water which will be available, which must be controlled during times of high runoff, and which must be preserved during drought conditions. Records of the watershed yield (inflow) and the water outflow (the withdrawals, releases, and overflow) will provide a history of the lake and its reliable yield. This information helps the water supply predict and properly respond to drought conditions.

A routine sampling procedure will provide information on water quality at various locations and depths in the lake. The samples should be analyzed for dissolved oxygen, pH, alkalinity, temperature, and bacteria, and should be examined microscopically. This information will show areas of anaerobic conditions, areas of algae growth, and layers of stratification.

1.1 Intakes

A. General

Intakes are used to withdraw water from the lake or impoundment for the purposes of releases to the water supply system. The ideal intake will be capable of taking water from various levels and screening it to prevent algae scums, trash, logs, or fish from entering the system.

B. Intake Appurtenances

Intake appurtenances are screens, gates, etc. Screens are provided to prevent the inflow of trash, fish, logs, etc. Double screens should be used so one screen can be pulled and cleaned while one remains in place. Gates are valves which completely close an inlet. Intakes should have multiple inlets at various depths so the water can be taken from the level which has the best quality.

C. Intakes on Rivers and Streams

Intakes on rivers and streams are more likely to clog due to the accumulation of leaves, sticks, and debris. These intakes should be equipped with screens which are easily removed for cleaning. In some installations, traveling screens are installed which continuously move through the flow of water and are cleaned by a stream of fresh water directed on the reverse side of the screen.

D. Silt Removal

Intakes, particularly on rivers and streams, frequently have accumulations of silt due to the settling of suspended matter in the water. Provision must be made to remove this silt periodically, either by use of a trash pump or by mechanical excavation.

1.2 Dams

For classifications, types, sizes, constructions, operations and regulations concerning dams, contact the Safe Dam Program of the EPD's Water Resources Branch. The EPD's requirements must be included in the O & M Plan.

1.3 Wells

Wells are a very common source of supply for water systems. Wells should be constructed, tested, and operated in accordance with EPD's Rules for Safe Drinking Water, Chapter 391-3-5, and the "Minimum Standards for Public Water Systems", latest edition.

- A. Records
 - 1. Records of the water levels in the well should be recorded periodically. The water level in the well can be observed by inserting a probe into the well which registers when contact with water is made. Continual water level readings can be obtained by employing an air line in the well and a recorder. Air lines break after a period of time so sudden changes in the readings or no readings can indicate a damaged air line. The pump usually has to be removed from the well

to replace the air line. The impact of long-term and short-term droughts of varying intensities only can be known with adequate records. Adequate long-term records of flow and level may substantiate the effects of other ground-water withdrawals nearby.

2. Records of the water withdrawn should be monitored by a meter. If the meter has a flow recording device, the rates of flow and the total flow can be observed. If a recorder is not available, the operator can time the meter for a specific period of time (e.g., one minute, etc.) and determine the rate of pumping. The amount of water pumped is necessary for monthly and bi-annual production reports. Careful comparison of the water pumped and the well levels usually can detect wear on the pump. This could provide a warning of possible pump failure.

B. Pumps

- 1. The types of pumps normally used in wells are submersible or vertical turbine. The vertical turbine pumps have the motor mounted on the discharge head and the pump is driven by a shaft. Shafts may be open or enclosed. Enclosed shafts are lubricated by oil; open shafts are lubricated by the water.
- 2. Maintenance of well pumps usually is performed by the water well contractor who has the equipment to pull the pump from the well to work on it. Submersible pumps require no routine maintenance by the operator. Maintenance of a vertical turbine pump includes checking the packing gland where the shaft comes through the casing. Packing glands should be checked frequently and never tightened to the point where there is no leakage, since this will cause premature packing wear. When the packing wears or when the gland cannot be tightened any further, a new set of rings should be installed. Other maintenance of vertical turbine pumps is lubrication of the shaft and the electric motor.
- C. Well Bore Maintenance

The yield of the well can be affected by rock fractures, a damaged or clogged well screen, or other causes. The compilation of water level and pumping records provides information which can be evaluated by a qualified hydrogeologist. The hydrogeologist should be able to determine the problem and recommend corrective procedures such as acid treatment, deepening the well, or the replacement of screens, etc.

D. Water Quality

An analysis of the well water quality should be made periodically (preferably annually). The results should be compared to the previous results to determine if there is any change in the water quality. A change in quality can indicate over-pumping of an aquifer, possible pollution or contamination of the source, and the need for additional treatment.

CHAPTER 2 - TREATMENT

Treatment of raw water is necessary in all public water systems to prevent the transmission of contaminants to the consumer. The contaminants could be toxic, cause disease, or have other long-term health effects for the consumer. Water also must be treated for aesthetic contaminants (i.e., color, turbidity, taste, odor, and corrosivity) so the consumer continues to have trust in the quality, taste, and odor of the drinking water. Because of this trust, the water supplier and operators have a continuing challenge to provide water of the highest possible quality at a time when there is an ever increasing possibility of contamination.

Outlined in this chapter are typical examples of operations and maintenance procedures for water treatment processes. The water supplier may use these as guidelines for preparing similar descriptions for inclusion in an O & M Plan or may want to develop customized information applicable to a particular process or system.

2.0 Chemical Addition and Handling

Chemical addition in the treatment process occurs at several different locations such as "pretreatment" at the head end of the plant; "in process" such as filter aids applied to the filter influent; and "post-treatment" applied to the clearwell. The large variety of chemicals available for water treatment is used for the following purposes: coagulants; pH adjustment; taste and odor control; disinfectants; corrosion control; polymers or filter aids; algae control; softening; and fluoridation. Chemicals also come in a variety of states, such as solid (granular, powder, or flakes), liquid (solutions), and gas. Because of their natures, each must be handled in their own special way. There is a large amount of written material available on this subject so only the more common chemicals and applications will be described. The most important consideration in the addition of a chemical to the treatment process is the determination of the dosage or rate of feed and how the chemical will react with other chemicals used in the process. In addition, it is required that any treatment chemical that come into contact with drinking water must be certified and listed for conformance with the ANSI/NSF Standard 60.

A. Coagulation Chemicals and pH Adjustment

Coagulation and pH adjustment chemicals - For the purpose of these procedures, these coagulation and pH adjustment processes will be described jointly since they are the foundation of the coagulation/flocculation sedimentation process. The relationship of pH to floc formation is very important. The most commonly used chemicals for these purposes are aluminum sulphate (alum), either liquid or granular for a coagulant, and calcium hydroxide (hydrated lime) for pH adjustment. The test used to determine the dosage rate for each chemical is the jar test. A jar test is an attempt to duplicate the water treatment processes in glass beakers with varying doses of chemicals so the floc formation and settling can be observed in a laboratory setting.

Many waterworks manuals describe the jar test and provide sample forms for recording the test data. From the tests performed, the operator can select what appears to be the

most effective combination of chemicals and then can set the chemical feed dosages accordingly. The jar test cannot duplicate exactly the actual plant conditions so the results of those chemical settings must be observed at the effluent of the sedimentation basin and adjustment made accordingly. Jar testing is highly recommended because correct chemical dosage can produce a high-quality water and be a cost-saving factor.

1. Jar Test Procedures

Prior to starting a jar test, a sample of the water to be tested should be analyzed for turbidity, temperature, pH, alkalinity, hardness, and color. The results should be recorded on a jar test results form. The amounts of chemicals to be added to each of the six beakers should be calculated and prepared for immediate addition to the beakers at the proper time.

- a. Collect at least a two-gallon (eight liters) sample of water to be tested.
- b. Immediately measure six 1000 ml quantities and place into six 1000 ml beakers.
- c. Place all six beakers on the stirring apparatus.
- d. With a measuring pipet, add increasing dosages of the coagulant solution to the beakers as rapidly as possible. For example, add enough solution to be equivalent to a 10 mg/L dose in beaker #1 and add enough solution to be equivalent to a 12 mg/L in beaker #2.
- e. Add uniform amounts of the pH chemical solution to each beaker. These amounts should be calculated so the finished water is approximately 7.0 to 7.5 pH. On a subsequent jar test, the feed rates for both the coagulant and pH can be variable to determine the correct dosage of each.
- f. Add standard solutions and feed rates for any other chemicals normally used. If a coagulant aid is used, the alum feed rate may be uniform for all six jars and the coagulant aid could be the variable.
- g. Quickly lower the stirring paddles into the beakers and activate the paddles immediately for one minute at 80 rpm. The specified rate and time are typical of the action and detention time found in many treatment plants, but calculations have to be made to meet actual conditions present in your treatment process.
- h. Reduce the mixer speed to 20 rpm for 20 minutes to simulate the flocculation basin conditions. Again, time and rate adjustments should be made according to the treatment plant conditions.
- i. Record the time required for visible floc to form and describe the floc characteristics (pin-head sized floc, flake sized floc) during mixing.

- j. Stop the stirrers. Allow the floc to settle for 30 minutes or for a period similar to your plant conditions. Observe and note how quickly the floc settled, the floc appearance, and the turbidity of settled water above the floc. You can remove a sample of the clear water with a pipet for testing.
- k. Using the sample of clear water from each beaker, measure the turbidity, pH, and alkalinity of the water.

Evaluate the results of the jar test. Several factors should be considered such as rate of floc formation, type of floc particles, clarity of water between floc particles, size of floc, amount of floc formed, floc settling rate, and clarity of water above settled floc. The following comments will assist in evaluating the results.

Visible floc formation should begin shortly after the rapid mix portion of the jar test. During the flocculation mixing, a number of small particles will gradually clump together to form larger particles. Floc particles which are separate and fairly dense in appearance are usually better than floc particles that have a light, fluffy appearance. Large floc is impressive but it is neither necessary nor always desirable. Large, light floc does not settle as well as smaller, denser floc, and it is more subject to shearing (breaking up).

The water between the floc particles should be clear and not hazy or milky in appearance. The best chemical dosage is one which produces a finished water that meets the SDWA standards at the lowest cost. The floc should settle quickly after the mixing has stopped. Floc that remains suspended longer than 15 to 20 minutes would be carried over onto the filter media. The jar tests can be repeated using other combinations of chemicals to produce the best results for turbidity, pH, and alkalinity. The pH should preferably be between 7.0 and 7.5 and the alkalinity should be greater than 40 mg/L and at least half of the coagulant dose rate.

Jar tests are an effective tool for predicting the results of the treatment process and evaluating various combinations of chemical feed and different chemicals. These test results are used to adjust or verify the feed rates in your treatment plant.

A jar test should be run at the beginning of each shift and more frequently when the raw water turbidity is high or changing. There is no substitute for experience in evaluating jar test data. Frequent tests will provide a basis for comparing results of the quality of finished water under different conditions and aid in fine tuning of the chemical feed dose rates. Always verify the effectiveness of a change in treatment based on a jar test result. To verify the jar test results with treatment plant performance, after the changes have been in effect for sufficient time to show results at the rapid mix chamber, collect a sample just down stream from the rapid mix chamber. Mix the sample on the jar test equipment under the same conditions as the original sample (not including the rapid mix simulation). This sample should show similar results to the original test sample and a comparison of these results could be the basis for further fine tuning of the chemical dosage.

In addition to jar tests, Zeta potential tests and the use of streaming current detectors also are used to help control the coagulation/flocculation process.

2. Alum and Lime

The application of the alum and lime for coagulation should be at the rapid mix chamber. Dry chemicals are fed by a dry volumetric feeder which applies the chemical at a constant volume per unit time to a tank or container of water. If necessary, the tank has a small mixer to dissolve the chemical into solution. If the chemical is already in solution (liquid alum), it is pumped into the treatment process by a volumetric pump which pumps a set volume of the liquid per unit of time. Each type of feeder is adjustable for varying rates of feed.

The operator should verify the quantity being fed by collecting the output of the feeder for a specific period of time (one minute is normal) and, through weighing or measuring, verify the actual chemical dosage rate.

3. Other Coagulants

There are other coagulants and coagulant aids which can be used for water treatment. Common coagulants are ferrous sulfate, ferric sulfate, polymer, and ferric chloride.

- B. Taste and Odor Control
 - 1 Causes

The causes of taste and odor problems are many and can show up at any point in the water supply system. Sometimes the effort to treat the water to make it potable destroys microorganisms which release taste and odor compounds. The causes of tastes and odors can range from biological growths (i.e., algae and plankton); environmental conditions (i.e., the depletion of oxygen in certain layers of the lake or reservoir water); the release of organic chemicals by decaying vegetable matter; man's activities (i.e., domestic and industrial wastes); chemical spills; and agricultural activities (i.e., fertilizers, chemicals, and soil erosion). Within the water system there can be taste and odors due to dead end mains, open reservoirs in which algae grow, septic sludge in settling basins, and the reaction of chlorine to organic materials in the water.

2. Chemicals

The causes and locations of taste and odor problems are varied, so the chemicals used and the points of application are many and varied. The following list of chemicals includes some commonly used taste and odor controls.

a. Powdered activated carbon (PAC) is a dusty, messy material to handle and should be converted to a slurry (mixed with water) as early in the process as possible. The dry material is fed by a dry chemical feeder (volumetric) into a tank of water having a mixer, and the slurry then is pumped into the treatment process. Because the carbon is highly combustible, it should be stored away from other chemicals, particularly potassium permanganate (KMnO₄), HTH (high test hypochlorite), and sodium chlorite (NaCI).

The amounts of activated carbon required have been described as up to 15 mg/L, but there is no specific test to determine the necessary amount. The trial and error method will best determine the quantity. Records of what was done in previous incidents could be used as a guideline. The activated carbon can be applied at the intake or at the rapid mix area of the plant, so there is time to react (adsorb) with the taste and odor causing constituents before it reaches the filters which should remove any remaining carbon from the water.

CAUTION - Do not add chlorine at the same point or upstream from the activated carbon application since the activated carbon will adsorb the chlorine and neutralize the effectiveness of both chemicals.

Activated carbon can be added to the filter influent to establish a layer of the activated carbon on the top of the filter media. The activated carbon, which is very light in weight, is washed away to waste when the filter is backwashed.

Granular activated carbon (GAC) can be used as a filter media in a rapid rate sand filter where it can produce a low turbidity water. It also absorbs organic materials that cause taste and odor problems and is effective in the removal of potentially toxic or carcinogenic trace organics. When used for these purposes, the GAC must be regenerated or replaced periodically. GAC is also used as the media in carbon contactors, described in Section 2.10B of this chapter, for the adsorption of volatile organic materials.

- b. Potassium permanganate (KMnO₄) is supplied as dry, purple crystals which are readily dissolved in water. Potassium permanganate, a highly effective oxidizing agent, destroys tastes and odors, and readily oxidizes soluble iron and manganese into insoluble oxides. This chemical always should be applied upstream from filtration preferably at the intake or at the rapid mix basin. Potassium permanganate usually is applied in dosages up to five mg/L. Visual control is possible since it turns the water a pink-purple color. The dosage must be low enough so this color does not extend beyond the filters. This chemical comes in dry crystals and can be mixed with water and fed by dripping or by a solution pump.
- c. The use of prechlorination (the addition of chlorine at a point at or near the raw water intake or in the rapid mix basin) can be an effective taste and odor treatment since it also is a powerful oxidant; however,

sometimes this treatment can aggravate and prolong the problem through the formation of other organic compounds. Only experience will teach the operator the correct action to take in each case. Also, the post-chlorination process can intensify the taste and odor producing compounds in the distribution system resulting in complaints from the customer when the taste and odor cannot be detected at the treatment plant. When this happens, chlorine dioxide or a chloramine compound could be used as a post-disinfectant. The feeding and handling of chlorine will be discussed further under disinfection.

- d. Copper sulphate (CuS0₄-5H₂0) is provided in crystal, lump, and powder form and is an algicide used in raw water supplies to eliminate the growth of algae. There also are liquid solutions available as an algicide which contain copper sulphate. The liquid chemical can be applied by spraying the surfaces of bodies of water. In reservoirs and impoundments, the dry chemical is placed in bags and pulled through the water so the entire surface of the lake, reservoir, or impoundment is covered.
- C. Corrosion Control
 - 1. General

Water sometimes is unstable due to low pH, high level of dissolved oxygen, and low alkalinity. This results in chemical reactions causing tuberculation which is the build-up of corroded materials on the inside of the pipes. Buildup reduces the cross sectional area of the pipe and available flow. The roughness of the buildup requires more energy, increasing pumping costs.

The corrosivity in water usually is evidenced by the visual observation of the effects of corrosion on metal pipes when they are excavated for repairs or replacement. Customer complaints of dirty water also is an indication that a corrosive condition exists in the system. Records of customer complaints plotted on a system map can help locate the problems.

Corrosion can cause metals in pipe materials, such as iron, copper and lead, to deteriorate and go into solution. These metals are carried by the water and then consumed by the customer. The iron in the water usually is noticeable in rust stains on clothing. Lead and copper in drinking water is not noticeable to the consumer, but is a serious health hazard when present in elevated levels.

2. Cause

Corrosion in pipes is caused by reactions between the water and the metal in the pipe. This appears as rust and tuberculation (buildup of rust). Some of the factors which affect the rate of corrosion are:

- Temperature Higher temperatures cause more rapid chemical reactions (i.e., reactions which occur inside hot water tanks);
- Low pH;
- Low alkalinity;
- Velocity Corrosive water at high velocity causes rapid pipe deterioration but shows little metal pick up. Low velocity with more contact time will have more metal pick up resulting in red water;
- Galvanic corrosion When two different metals come into contact, there is a chemical reaction which produces a flow of electrons from one metal to the other causing corrosion;
- Dissolved gases Oxygen increases the rate of corrosion. Carbon dioxide reduces pH and increases corrosion. Nitrogen tends to lower corrosion rates.

D. Disinfection

1. General

The disinfection of water is the selective destruction of pathogenic organisms. The destruction of all organisms is called sterilization. This is too expensive and not practical in water treatment.

The destruction of pathogenic organisms is the destruction of all disease-causing organisms. The Safe Drinking Water Act requirement is to destroy almost all coliform bacteria. The total coliform group merits consideration as an indicator of pollution because these bacteria always are present in the normal intestinal tract of humans and other warm-blooded animals and are eliminated in large numbers in fecal wastes. Thus, the absence of total coliform bacteria is evidence of bacteriologically-safe water.

2. Chemicals

The chemicals commonly used for disinfection are chlorine, calcium hypochlorite, sodium hypochlorite, and sodium chlorite. There are other chemicals (i.e., iodine, bromine, and ozone) which will disinfect water, but are not as commonly used in water treatment.

- a. Chlorine
 - 1) General Description

Chlorine disinfection is described in Section 2.2.A of this chapter. Chlorine is a greenish-yellow gas which has a very penetrating, acrid odor that burns the eyes and the throat. Chlorine gas is two and onehalf times heavier than air and, therefore, tends to collect in low areas such as pits, basements, and sumps. Chlorine gas is supplied under pressure in 100 or 150 lb. cylinders or in 2000 lb containers. Chlorine also can be delivered by railroad car, but this is not common for water suppliers.

The chlorine cylinders must be protected from exposure to heat because a rise in temperature can cause an increase in pressure which could rupture the steel cylinders. The cylinders are equipped with a fusible plug which softens and melts at 158° F to 165° F to prevent the buildup of pressure. Chlorine cylinders must be secured in an upright position to prevent failing over and damaging the valve. Also, the valve should be protected with a protective cap when not in use.

2) Method of Feeding

The chlorinators used to feed the chlorine are vacuum controlled so the chlorine gas only can be released when a vacuum is present. The chlorine gas then is injected into a stream of water at the injector. The flow of water, through a small orifice in the injector, creates the vacuum which draws the chlorine gas into the stream of water. The solution of chlorine and water then is conveyed to the point of application.

A typical chlorinator has a pressure-reducing valve to lessen the pressure, a rate valve and rate meter to control the rate of flow, and a valve which shuts off the supply of chlorine gas when a vacuum is not present.

3) Determination and Control of Feed Rate

The amount of chlorine applied depends on the point of application and the expected result. For example, the amount of chlorine applied to raw water to control algae growth and prevent tastes and odors can be at relatively high rates because the organic materials in the water react with the chlorine. In this situation, the goal should be to carry a measurable chlorine residual to the filter influent water. This may require the application of chlorine at rates of 3 to 4 mg/L. The amount of chlorine applied to the clearwell should be adequate to maintain a detectable residual of free chlorine in all parts of the distribution system in the recommended amount of 0.2 mg/L.

The rate of feed in a gas chlorinator is controlled by a flow rate adjusting valve and a rate meter which indicates the rate of flow. In some installations there may be chlorine residual monitoring equipment which automatically paces the rate of feed to maintain a specific chlorine residual at a specified location downstream from the point of application.

4) Precautions and Abnormal Situations

- Chlorine gas is extremely toxic and can cause death when inhaled. All safety precautions must be observed.
- Exhaust fans must be used to ventilate the chlorine room in the event of a leak. Ideally, fans should push air into the room from the ceiling or a high point on a wall and the exhaust must be from close to floor level. This prevents the chlorine gas from passing over the fan and motor. Chlorine gas is very corrosive and can damage the fan and the motor.
- Self-contained breathing apparatus must be used if there is any suspicion of a leak.
- Chlorine leaks can be checked by using a rag on a stick dipped in ammonia. When passed near the chlorine leak, a white vapor will form.
- When a leak is suspected, always work with a backup person to help you out if you are overcome.
- When a leak cannot be repaired and could become a threat to the area, contact the fire department for help.
- If a chlorine cylinder or container is leaking, call the supplier for help.
- Avoid drawing more than 40 lbs of chlorine per day from any one cylinder. If more chlorine is required, the withdrawal should be from multiple cylinders manifolded together.
- b. Calcium Hypochlorite and Sodium Hypochlorite
 - 1) General Description

Calcium hypochlorite is a dry, white chemical in granular or tablet form. When used for disinfection, it should be mixed in a solution of water and fed by solution pump into the water to be treated.

Sodium hypochlorite is a light yellow liquid which is commonly used as bleach; however, the concentration of sodium hypochlorite used in water treatment is much higher (up to 15 percent). The liquid usually is supplied in five-gallon carboys; however, some smaller systems purchase one-gallon containers.

2) Method of Feeding

Both calcium hypochlorite and sodium hypochlorite solutions are fed by means of a metered solution pump. The powder or the liquid is diluted with water in a solution crock to a predetermined strength, usually about a one-percent solution.

3) Determination of Feed Rate

The amount of calcium hypochlorite or sodium hypochlorite applied to the water is determined by the free chlorine residual which is necessary to provide adequate disinfection of the water and maintain a residual in the recommended amount of at least 0.2 mg/L in all parts of the distribution system. Each system should develop criteria to determine the necessary chlorine residual at the point of application. However, the temperature, pH, and any organic substances in the water must be considered when setting application rates.

- 4) Precautions and Abnormal Situations
 - Calcium hypochlorite is a dry powder which does not fully dissolve in water; therefore, a sediment of undissolved chemicals is present in the bottom of the solution tank. Therefore, the pump suction line should be kept off the bottom of the tank to prevent this sediment from being drawn into the pump.
 - The hypochlorite solutions are very corrosive and should not be in contact with metals.
 - The hypochlorite solutions are very strong alkali bleaches which can be a skin irritant. Eyes should be protected from solution splashes or airborne powder (dust).
- c. Sodium Chlorite
 - 1) Description and Feeding

Sodium chlorite (NaCIO₂) is used in combination with chlorine to generate chlorine dioxide (CIO₂). Sodium chlorite is a dry powder which is mixed into a solution. The chlorine gas also is mixed with water in solution. The two solutions are mixed together as they flow upwards in a chlorine dioxide generator. The chlorine dioxide solution then is applied to the water.

2) The determination of the feed rate is based on the amount of chlorine applied and on the maintenance of an adequate chlorine residual in the water.

3) Precautions and Abnormal Situations

Sodium chlorite must be handled very carefully since it is combustible around organic compounds. Combustible materials should not be worn when handling sodium chlorite. If sodium chlorite comes in contact with clothing, the clothes should be removed immediately and soaked in water to remove all traces of sodium chlorite.

E. Fluoridation Chemicals

Fluoride is added to water supplies for the purpose of preventing tooth decay.

1. Chemicals

There are three common fluoridation chemicals -- sodium fluoride, sodium silicofluoride, and hydrofluosilicic acid.

a. Sodium fluoride and sodium silicofluoride are supplied as a dry, white powder usually in paper bags. The dust from these chemicals can irritate the nose and throat.

These chemicals are fed either by dry chemical feeders where they are added to water to form a solution or, in the case of sodium fluoride, it is commonly fed through a saturator where water is passed through a layer of sodium fluoride and the chemical is dissolved into solution.

These dry chemicals must be handled carefully when loading the feeders. If emptied too quickly, the airborne fluoride dust levels may become too high.

- b. Hydrofluosilicic acid is a liquid supplied in carboys. Normally the chemical is fed at full strength directly from the carboy; however, if the liquid must be transferred, care must be taken to avoid splashes or spills. The liquid is very corrosive and irritates the skin and eyes. The fumes are pungent and irritating. The carboys should be vented to the outside so the fumes and odors do not accumulate. All storage areas should be well ventilated.
- F. Softening Chemicals
 - 1. Chemicals

Two water softening methods are commonly used to remove water hardness. One of these is the lime-soda ash process. The chemicals used are lime, either hydrated lime (slaked) or quicklime (unslaked), soda ash, caustic soda, and carbon dioxide. The second method is the ion exchange process which uses rock salt.

- a. Quicklime Its use usually is limited to very large softening plants where the cost of installation and operation of lime slaking equipment can be offset by the lower cost of the quicklime.
- b. The feeding of hydrated lime (Ca(OH)₂), soda ash (NaCO₃), and caustic soda (NAOH) is described in Section 2.0.C of this chapter.
- c. Carbon dioxide is used for recarbonation and is a relatively simple process. The carbon dioxide is purchased as a liquid in compressed gas cylinders and is dispersed into the water through pipes and diffusers.
- d. Rock salt used for the ion exchange process usually is delivered in bulk truck load quantities into the salt bins. The salt bins are constructed so water can be sprayed on top of the rock salt, dissolving the salt into a saline solution. The saline solution flows from the bottom of the salt bin into a brine holding tank. It then is diluted and fed by an ejector to the softening units during the regeneration cycle.

2.1 Conventional Filtration Treatment Plant

A conventional filtration treatment plant is used for the treatment of surface water to remove turbidity (particulate matter) and microbiological contamination (bacteria, *Giardia* and *Cryptosporidium*). These treatment plants typically have chemical addition (described in Section 2.0 of this chapter), rapid mix, flocculation, sedimentation, and filters as the flow of the treatment processes. A variation of the conventional filtration treatment plant would be a plant which has a solids contact unit which includes the rapid mix, flocculation, and sedimentation processes in one compact unit. Another variation is the direct filtration treatment plant which may omit sedimentation, add the coagulant chemicals to the raw water, and direct the raw water onto the filters. The operation of this type of plant requires very careful monitoring of the process.

The following is a brief description of the operation and maintenance of each of these components.

A. Rapid Mixing

1. General Description

Rapid mixing is the initial high speed agitation of the water to ensure a quick dispersion of the chemicals in the processed water. This action causes the chemical to be distributed uniformly throughout the water. This process usually is located immediately preceding the flocculation or coagulation basin and immediately following the addition of chemicals.

There usually are two parallel mixing units, each mounted over a relatively small square chamber having a maximum detention time of 30 seconds. It is desirable for the water to rapidly come into complete contact with the chemicals so the chemical reactions begin; however, it is not desirable that any settling of chemicals or materials occur in these chambers. Although there are static rapid mixers, the most common are electric driven motors having a long vertical shaft with a propeller extending into the water flowing through the chamber.

2. Start-up

Start-up of the rapid mixers coincides with the start of flow through the plant and the start of chemical additions. A pre-start check should determine:

- a. Doest he shaft turn freely?
- b. Is any lubrication required?
- c. Are there any unsafe conditions (e.g., exposed wires)?
- 3. Normal Operating Conditions

Rapid mixing is a continuous process which requires no controls or monitoring.

4. Monitoring

Visual monitoring of the rapid mixing units will provide an indication that they are operating and are effective. If they are operating correctly, there will be an obvious turbulence to the water. Records

5. Records

There are no specific records of operation for the rapid mixing units except the records of maintenance and repairs performed.

6. Maintenance

Maintenance of the rapid mixing units consists of lubrication in accordance with the manufacturer's recommendations and a periodic check of the mixing chambers for a buildup of chemicals on the walls and bottom. The removal of any buildup should be made before it hinders the operation of the mixers or changes the characteristics of the flow.

- B. Coagulation / Flocculation
 - 1. General Description

Coagulation is the effect of chemicals added to the raw water reacting with the particulate impurities, especially lightweight particles, to form a floc. A floc is the accumulation of the chemicals and the particulate matter to form small jelly-like particles which look like snowflakes in the water. As these pieces of floc clump together and combine with more particulate matter, they grow into larger and heavier floc which will settle out.

The coagulation process is a very complex chemical and physical reaction which depends on many factors, such as pH, alkalinity, turbidity, temperature, and hardness. It also depends on the chemicals and dosages of chemicals used for coagulation and the physical treatment of the water, such as rapid mixing, flocculation, and baffles used for rapid and slow agitation of the water to cause collisions between the chemicals (floc) and the particulate matter. Rapid mixing is described in 2.1.A of this chapter.

Flocculation units may be of many configurations (i. e. horizontal paddle wheels, vertical paddle wheels, vertical turbines, vertical propellers, etc.). Each configuration should be carefully designed to provide satisfactory performance. The vertical configuration usually

requires less maintenance since it eliminates submerged bearings and drive mechanisms. Some flocculation can be caused by the turbulence resulting from baffle and orifices.

There usually are two parallel systems of coagulation/flocculation units in a treatment plant to facilitate removing one half of the basins from service for maintenance. The best flocculation usually is achieved by more than one unit in a series. Each unit is separated by baffles to prevent short circuiting. Also, all inlets and outlets are baffled to prevent short circuiting. The flocculators usually are driven by variable speed drive units. With multiple units, it is desirable to reduce the speed of the flocculators in each succeeding unit to prevent breaking up the large floc particles which have formed. The flocculators should have a detention time of 30 minutes.

2. Start-up

The flocculation units should be started approximately at the same time as the start-up of chemical addition and rapid mixing. Prior to start-up, the drive units should be visually checked for any damage such as loose wires or anything which would prevent the normal operation of the unit. During the winter, ice can prevent the rotation of the paddles, or ice cakes can damage the paddles or blades.

The operation of the flocculators is not directly interdependent on the operation of the upstream or downstream processes. Under unusual conditions, for a short period of time the treatment plant may continue to be operated with the flocculation units out of service, however, probably at a reduced flow rate. Under these conditions, careful attention to the chemical addition and the quality of water at the end of the sedimentation basins is necessary.

3. Normal Operating Procedures

Under normal operating procedures, the flocculation units operate at speeds which have been established by either the manufacturer or the engineer. The speed should not be varied without careful consultation with the engineer. In the event the flocculation units appear to be ineffective, a careful analysis of the process should be done using jar tests, varying both the doses of chemicals and the speed of the flocculators to determine if an improved process could be developed. Any analysis such as this should be carefully documented.

4. Monitoring

The flocculation units are monitored through visual observation of the formation of the floc as it passes through the units. The floc formation should be easily detectable with the naked eye. At the inlet to the flocculation units, the floc will be very fine and have a light sparkling appearance. As the heavier floc is formed, the particles will be larger and look like snowflakes. At times, a gradual change to a darker color can be noticed. It is good practice to periodically dip a small sample of water from different points in the treatment process into a glass jar or beaker to observe the formation of the floc. Experience in observing the appearance of the floc at various stages of treatment will be beneficial in evaluating the effectiveness of the treatment process.

5. Records

There normally are no separate records kept for the flocculator units except for routine and major maintenance which is recorded in the maintenance records. See Chapter 3 of Section I for recommendations for maintenance records.

6. Maintenance

The maintenance of the flocculation drive units usually is lubrication of the motor and drive units according to the manufacturer's recommendations. Horizontal paddles usually have submerged bearings, drive chains, or packing which requires additional checking and maintenance. Care should be taken during the winter to prevent damage from ice and slush. The flocculation basins should be drained approximately every six months to check the condition of the paddles or blades, to remove any accumulation of settled material, and to check on the condition of the basin's structure.

C. Sedimentation

1 General Description

Sedimentation is the slow, quiet settling of the floc and suspended matter from the water by gravity. The sedimentation basins can be rectangular or circular in shape. There should be at least duplicate units to facilitate cleaning. The basins should have a detention time of four (4) hours. The inlet devices should be designed to distribute the water for uniform velocities and care should be taken to prevent short circuiting of flows. The outlet devices also must be designed for uniform flow and to prevent short circuiting. The outlet devices should be submerged orifices. There should be surface skimming to collect floating debris, such as leaves, scum, etc.

There are many variations and accessories which may be designed into a sedimentation unit, such as sludge collection and removal, tube settlers, submerged baffles, and launders which provide both skimming and effluent troughs. Circular units may be called clarifiers and usually have some type of rotating sludge rakes which convey the sludge to a sump where it can be drawn off.

Tube settlers are a variation which were developed to increase the settling efficiency of rectangular basins and have been used in circular basins. The water enters the slanted tubes and is forced to flow upward. The suspended solids strike the walls of the tubes, lose their forward velocity, and tend to settle downward along the tube walls. Tube settlers can be added to existing sedimentation basins and solids contact tanks to increase the capacity of these units, or tube settlers can be installed in new facilities to provide a higher capacity in a smaller area at less cost.

2. Start-up

The start-up procedures for the sedimentation basins usually occur simultaneously and automatically with the start-up of the upstream units. The drive motors for sludge collection equipment also should be turned on at that time. There is no critical requirement that the sludge collection equipment be started immediately since the sedimentation process is very slow.

3. Normal Operating Procedures

There are no normal operating control procedures for the sedimentation basin except the speed of the sludge collection equipment which should be set according to the manufacturer's recommendations.

4. Monitoring

The monitoring of the operation of the sedimentation basin is by visual observation of the water entering and leaving the basin. By dipping some of the effluent water into a clear glass container, such as a beaker, and holding it up to the light, the operator should be able to observe a very light suspended floc. The water between the floc should be reasonably clear. It is normal for some of the very light floc to be carried onto the filter beds since this aids the filtration process.

5. Records

The only records of sedimentation basin operation are either the amount of time since the last basin cleaning or where mechanical sludge removal equipment is used, a record of the withdrawals of sludge, estimated quantities and percent of settled solid. The operator should check periodically for the accumulation of sludge.

6. Maintenance

Routine maintenance applies only to the sludge collection equipment which should be lubricated according to the manufacturer's recommendations. When the basins are drained for cleaning, the condition of the basins and the sludge collection equipment should be checked carefully.

D. Solids Contact Units

1 General Description

Solids contact units combine the coagulation, flocculation, and sedimentation functions together with recycling of solids for more efficient clarification of the water. The operation of solids contact units requires a good understanding of the operating processes which continuously are interacting within the unit. The mixing zone usually is very small in size and is similar to rapid mixing. The reaction zone is similar to flocculation and the separation zone is similar to sedimentation, except the water is forced down through the reaction zone and flows up through the separation zone. This requires the water to flow through an area which has a heavy accumulation of sludge. Thus, the incoming water comes in contact with the sludge.

The solids contact units have several advantages, such as the all-in-one unit which takes up less space and costs less to construct. The disadvantages are the solids contact units require the operator to have greater technical ability; require closer monitoring; are not suited to operations where the turbidities and solids are subject to large and rapid changes; and are not suited to non continuous operations and temperature changes.

Solids contact units usually are circular in shape. There should be two or more parallel units. The units should be equipped with sampling taps to permit sampling from each zone and at various levels in the separation zone. The flocculation equipment shall have an adjustable drive unit. Detention time should be two (2) to four (4) hours.

Solids contact units should be equipped with sludge collecting equipment and have the piping for periodic sludge withdrawal. The operator should be able to sample the sludge being withdrawn. The effluent shall flow over overflow weirs or through orifices to prevent short circuiting and nonuniform flows.

2. Start-up

Solids contact units work best when they are operated continuously and have a buildup of sludge available to aid the process. Therefore, all start-up operations shall be at a reduced flow rate until an adequate volume of sludge is present. Prior to starting the operation of the flocculation and sludge collecting, equipment should be checked. The start-up of the solids contact units should coincide with the start-up of the chemical feed equipment.

3. Normal Operating Procedure

The operation of the solids contact units is sensitive to rapid changes in the pH, alkalinity, turbidity, solids, temperature in the raw water, and flow rates. Changes in the above factors can affect the formation of floc, the settleability of the solids, and the maintenance of a sludge zone. The negative effects can be the carry-over of turbid water to the filters or the breakup of the sludge zone carrying large pieces and quantities of sludge on to the filters.

The operation can be controlled by applying the proper chemical dosage for each condition. The operation also is controlled over a longer period of time by controlling the amount of sludge and the recirculation of sludge. These conditions can be observed by checking the volume of sludge present in a sample from the sludge withdrawal piping and a sample from the flocculation zone. After these samples set for five to ten minutes, the sludge volume can be visually observed and should be from five to twenty percent in the flocculation zone, and over ninety percent in the sludge withdrawal piping.

4. Monitoring

Visual monitoring of the solids contact units effluent water will provide a good indication of its effectiveness. By placing a sample of the effluent into a clear glass container and holding it up to the light, the operator should be able to observe a very light floc and the water should be reasonably clear. The appearance of heavy floc, turbid, cloudy, or large clumps of solids indicates the process is not in proper balance. The operator should perform a jar test to determine the proper chemical dosage. The performance of a jar test is explained in Section 2.0.A of this chapter.

5. Records

By checking the volumes of sludge present in the samples drawn from the sample taps, the operator can determine the level of sludge in the unit and the concentration present. Through experience the operator will learn the proper amount, level, and concentration of sludge for

the best operation. The manufacturer's recommendations should be used as guidelines; however, the operator can, by keeping records and through experience, determine the best levels and concentrations of sludge for a particular raw water condition.

6. Maintenance

Maintenance of a solids contact unit consists of routine lubrication of the drive units for the sludge collection and recirculation units. The solids contact units usually are drained once a year to check the condition of the sludge collection equipment and the structure. When the units are drained, they should be cleaned of all sludge so that all parts of the sludge collecting equipment and the structure can be observed. Long-term maintenance can consist of repainting steel components, and patching and sealing the concrete structures. The repair of baffles, launders, sludge piping, valves, and sludge pumps can be done at this time.

E. Filtration

1. General Description

Filtration is the final barrier preventing particulate matter from entering the system. Filtration is the removal of floc and fine suspended particles from the water after it has passed through the sedimentation basins or solids contact units. The filtration process is the passing of the water through a bed of fine material, such as sand, coal, or other fine granular material. The filter media can be uniform in sizing, but higher and more effective filter rates are attained by use of mixed media. The filter process sometimes is described as straining, but the light floc carried on to the filter material from the sedimentation basins adheres to the grains of the filter media and this coating penetrates into the filter bed. This coating on the filter media attracts the suspended particulate matter which enhances the filtered water quality. This coating continues to build on the filter media and attracts more of the floc and suspended particulate matter.

As this coating builds and penetrates into the filter bed, the head loss across the filter becomes greater until the flow rate is greatly reduced. At this time the filter must be backwashed to cleanse the media of the floc and particulate matter.

There are several types of filters, such as direct, slow sand, pressure, diatomaceous earth and rapid rate gravity. Rapid rate gravity filters are the most commonly used and will be used for these procedures.

- 2. Start-up Procedures
 - a. If the filter has been drained, it should be filled slowly so the media are not disrupted. The filter should be filled through the backwash valve so it is filled from the bottom up, thus forcing most of the air out of the media. Fill the filter until the water level is above the washwater troughs. Any filter which has been out of service for more than a few hours always should be backwashed before being put into service again, because there is a good possibility that many bacteria will have grown in the filter media.
 - b. Backwash filter as follows (general outline):

- Check all filter valves to be sure they are closed;
- Close the influent valve;
- Filter until the water is lowered to six (6) inches above the surface of the media;
- Close the effluent valve;
- Open drain to waste valve;
- Start backwash pump or turn on source of water for backwash, slowly open the backwash valve until it comes up to the specified rate of flow;
- Start surface wash pump or turn on source of water for surface wash, slowly open surface wash valve;
- The backwash should be run until the desired clarity (desired turbidity and/or particle count) is obtained in the backwash water;
- Use a high pressure hose to wash down the walls of the filters and all other exposed surfaces since the silt particles will adhere to these surfaces. The high pressure hose should be equipped with a backflow preventer to prevent any possibility of a cross-connection;
- The surface wash should be operated for the necessary period of time, but the backwash water should be run at least two or more minutes after the surface wash is shut off;
- Close the backwash valve slowly to prevent water hammer;
- Close drain valve; Open influent valve slowly and allow water to come up to proper level;
- Open filter to waste valve. This flushes any loose sediment left from the backwashing of media, the underdrains and the effluent piping. At the end of the backwash, the filter media are left unconsolidated and the floc coating has been washed off the media. The filter must be filtered to waste until the bed settles in and the effluent water meets the requirements of the Safe Drinking Water Act. If there is no filter-to-waste capability, the bed should be left out of service for 30 to 60 minutes to let the media settle and consolidate. When filtering is first started, it should be at a very reduced rate of flow for the first 30 minutes to an hour and the turbidity should be carefully monitored. In this first hour of filter operation, there is great potential for a turbidity breakthrough which means particulate matter and bacteria can pass through to the clearwell;
- Close filter to waste valve and then open effluent valve.

- Record date, time, and headloss before and after backwash; record number of hours of operation since last backwash, quantity of backwash water used, and quantity of surface wash water used;
- Check rate-of-flow controller for proper operation and adjust flow rate of water onto filter. The filter should be eased into service at a reduced rate of filtration. When the filter is very clean, there can be a turbidity breakthrough until the media again become coated with the light floc. A careful observation of the turbidity monitor will indicate the proper rate of filtration;
- Monitoring of the filter effluent must comply with the requirements of the enhanced surface water treatment rules (ESWTR).
- 3. Normal Operating Procedures

The three controlling factors for normal filter operation are: (1) flow rate, (2) head loss, and (3) turbidity of the effluent. A recording or indicating gauge should be provided for each of these factors and the operator should make frequent observations.

- a. <u>Flow Rate</u> A flow rate controller limits the maximum rate of filtration by restricting the flow to a predetermined rate through the effluent pipe when the filter is very clean immediately after backwashing. As the filter media become progressively clogged, the loss of head across the filter increases and the rate of filtration gradually declines, and the low rate controller gradually opens to maintain the predetermined rate. Careful observation of the flow rate will predict the need for backwashing the filter.
- b. <u>Head Loss</u> The loss of head gauges measures the loss of head (resistance to flow) across the filter. This is the difference in pressure (water level) on top of the filter and the pressure on the filter effluent piping between the filter and the rate of flow controller. This pressure can be best illustrated by the height of water in a clear glass or plastic tube tapped into the effluent piping. The loss of head across a filter is an indication of the filter's condition, for example:
 - Immediately after backwash, the headloss should be nearly zero;
 - When the head loss is approximately seven to ten feet, the filter may develop a negative pressure in the filter media, causing turbidity breakthrough. When this occurs, the filter must be taken out of service;
 - A sudden increase in headloss can indicate filter clogging caused by a change in raw water conditions.
- c. <u>Turbidity</u> At the end of a backwash, the filter is left unconsolidated and the floc coating has been washed off the media. The filter must be filtered to waste or left out of service for 30 to 60 minutes until the filter media consolidate and the turbidity level is below the allowable level. When there is no filter to waste capability, the filter when first started should gradually be eased back on line to prevent turbidity break through. Otherwise, water with higher turbidities will be passed to the clear well. Filtration is the final barrier preventing particulate matter from entering the system.

From a water quality standpoint, the turbidity of the filter effluent will provide the operator with one of the best indications of the effectiveness of the overall treatment process. When the turbidity approaches the maximum allowable level, the filter must be removed from service and backwashed.

- 4. Monitoring of Filters
 - a. The visual monitoring of the filter operation includes the observation of the flow rate, headloss, and turbidity of the effluent for each filter. These factors can provide the operator with an accurate evaluation of the filter's condition and will indicate the corrective action to be initiated. For example, the filter should be backwashed when the flow rate decreases, the turbidity increases, and the head loss increases. If these changes happen in a relatively short period of time, the operator should check the filter influent since it may contain large amounts of floc. This would indicate the raw water conditions have changed and the chemical feed rates should be adjusted. If the turbidity increases but the headloss and flowrate do not increase, the operator should check the filter influent which may be cloudy and turbid. This also would require a change in the chemical feed rates. Any changes in chemical feed rates should be determined and verified by use of the jar test.
 - b. During the backwash procedure, the operator has a chance to observe a number of factors which will indicate the condition of the filter media. By allowing the water to drain down to the level of the media before starting the backwash, the operator can observe if the media are relatively level and does not have cracking or shrinkage away from walls. If the media are not relatively level, turbulent inflow of water may be the reason. These are all indications of mudballs or deep clogging of the bed. Proper backwashing at slightly higher rates and the use of the surface wash will help alleviate this problem. If the filter is not equipped with a surface wash, manual raking during the backwash will help dislodge the mudballs. There should be no spots boiling up when the backwash begins; however, if there are, this indicates the filter media are not uniformly distributed. If this cannot be corrected by intensive backwash, the media may have to be removed and regraded.
 - c. Air binding or entrapment can occur if the head loss limits are exceeded or when dissolved air in cold water is released due to a decrease in pressure. The entrapped air will cause increased head loss and will shorten filter runs. If air entrapment is suspected, the filter should be backwashed slowly at first, since the air can disrupt the uniformity of the filter media and cause media to be carried out of the filter.
 - d. If excessive head losses are indicated immediately after backwashing, the underdrain system may be clogged or fouled due to corrosion or chemical deposits. This condition would require the removal of the media to expose the underdrains. If the underdrains are clogged, they must be removed and cleaned or replaced.
 - e. Excessive head loss, flow rate, and turbidity readings always should be verified by calibration before any extensive corrective action is taken.
- 5. Records of Operation for Filters

Record keeping of the operation of the treatment plant and the filters is very important because it establishes a history of what was done and how various components reacted. This history is necessary for compiling data for reports to EPD, for engineers to design replacement or expansion of the treatment units, and for determining actions to take during unusual or emergency situations.

Listed below are types of records to be maintained.

- a. Water produced.
- b. Amount of wash water used.
- c. Volume of surface wash used.
- d. Number of filter units in service.
- e. The length of filter runs between washing.
- f. Turbidity and head loss Continuous recording as required by the regulations.
- g. Process equipment performances; notes on equipment out of service; maintenance performed; equipment calibration; and accidents or unusual occurrences.
- 6. Maintenance
 - a. The filter control valves should be checked routinely for proper operation and any leakage.
 - b. The instruments used to check the filter operation, headloss gauge, flowrate controller, particle counter and turbidimeter would be calibrated on a frequent and regular basis.
 - c. The filter media should be examined annually to evaluate its overall condition. Is the media uniformly graded and distributed? Is there the proper depth of each gradation of media? Expose the underdrain system to check if the holes or nozzles are clogged.
 - d. The backwash and surface wash pumps should be checked and lubricated according to the manufacturer's recommendations.
 - e. The surface wash equipment, including nozzles, should be checked periodically for free operation and proper position over the media.
- 7. Other Types of Filters
 - a. Pressure Filtration Pressure filters can have sand, dual media, and mixed media. These filters are similar to rapid rate gravity filters, except they are completely enclosed in a pressure rated vessel. These filters usually are used only on small installations; however, several may be installed in parallel. These filters have the same operation and problems as gravity filters except the filter media cannot be readily observed.
 - b. Diatomaceous Earth Filtration Diatomaceous earth is a very fine silica earth used as the filter media. A slurry of the filter medium is added to the water which then collects on the filter surfaces which are porous pipes or screens. After the coating is applied, water is filtered through the precoated surfaces. The coating may be supplemented during the filtration process by feeding small amounts of the filter medium with the water. These filters most often are used in industrial applications and swimming pools.

- c. Slow Sand Filtration The water is applied to the surface of the filter and is drawn through the sand medium by gravity. The sand medium shall be at least 30 inches deep and supported by a gravel bed. The rate of filtration shall be 45 to 150gallons per day per square foot of sand area. In a rapid sand filter, the particulate matter and the bacteria are formed into floc by the addition of chemicals. Then the floc is strained from the water by the filter media. In the slow sand filter the particles are removed by straining, adsorption, and biological action which occurs in the top two inches of the sand. This layer is called a Schmutzdecke and is necessary for the filtering action to be effective. When the Schmutzdecke becomes too thick, it must be removed by scraping the top six inches off the filter. The sand is washed and replaced when the sand depth is reduced to two feet. These filters require rather large areas and must be filtered to waste until the Schmutzdecke is developed. These are effective only on very low turbidity waters and have filter runs up to several months.
- d. Direct Filtration Direct filtration normally is used only on very low turbidity water (preferably not more than 10 NTU). The raw water is treated with coagulant chemicals and a coagulant aid (polymer) passes through a rapid mix chamber or in-line mixing to quickly form a floc. The water then flows directly onto the filters, which are usually multimedia designed specifically for this type of treatment. This treatment process requires careful monitoring to assure that the turbidity standard is not exceeded.

2.2 Disinfection

The water supplier must deliver a product which is free of disease-causing organisms. Disinfection destroys disease-causing organisms, also called pathogenic organisms. Through the use of good water treatment practices and, more particularly, the disinfection of water with chlorine, outbreaks of serious diseases such as typhoid and cholera are very infrequent in the United States. The application of a disinfectant as a final treatment process is the typical practice; however, the disinfectant can be applied at other points in the treatment process. It is not unusual to apply additional disinfection at points in the distribution system or at distribution storage facilities, when necessary.

Water can be disinfected by heat, radiation, or chemical treatment; however, the only widely accepted method is chemical treatment. The reason chemical treatment is so widely accepted is that the chemical is applied in amounts which, after completion of the disinfection, leave a chemical residual which would be available for further disinfection of the water if necessary. The ability to detect this chemical residual, by means of a simple test at any point in the distribution system, is an assurance that the water is free of pathogenic organisms. Only the more commonly used chemicals will be described in this chapter. Other methods of disinfection in approved use, now or in the future, may be described by the water supplier and used in their O & M Plan.

- A. Chlorination
 - 1. General Description

Chlorination is the process of applying chlorine (CI_2) to water (H_2O) to form Hypochlorous acid (HOCI) which is a free chlorine residual. This chlorine

residual reacts with impurities in the water including the pathogenic organisms. As the chlorine reacts with the impurities, it is changed to chloramines and chloroorganic compounds which have a lower potency than the free chlorine residual. The free chlorine will continue to react with the impurities in the water, such as organic materials and organisms, until all the impurities and organisms are destroyed and there is an excess of free chlorine. It is important to recognize that the combination of sufficient free chlorine residual and adequate contact time are essential for effective killing of the pathogenic organisms.

Other critical factors which can affect the disinfection process are:

- Injection point and method of mixing to achieve total contact with water being disinfected;
- Contact time The longer the contact time, the more effective the disinfection;
- Effectiveness of other upstream treatment processes; (e.g., the lower the turbidity, the better the disinfection because there is less interference from other substances);
- Temperature The higher the temperature, the more rapid the rate of disinfection and also the more rapid the depletion of the free chlorine residual;
- The dosage and type of chemical Usually the higher the dosage, the quicker the disinfection. The form of the chemical such as chloramines or free chlorine residual also affects the disinfection rate;
- The pH The lower the pH, the more effective the disinfection;
- The free chlorine residual There must be a detectable residual of free chlorine residual (in the recommended amount of at least 0.2 mg/L) in all parts of the distribution system. The regrowth of organisms can occur in the distribution system depleting the free chlorine residual;
- Higher free chlorine residuals Systems may increase residual disinfectant levels in the distribution system of chlorine or chloramines (but not chlorine dioxide) to a level to exceed MRDL for a period of time necessary to protect public health, to address specific microbiological contamination problems caused by circumstances such as, but not limited to, distribution line breaks, storm run-off events, source water contamination events, or cross-connection events.

Organics found in the water can consume great amounts of disinfectants while forming unwanted compounds. The reaction of chlorine with certain organic precursors can form trihalomethanes such as chloroform. These trihalomethanes are known to cause cancer. Prechlorination of raw water containing organic precursors is more likely to form trihalomethanes than post-chlorination because the coagulation/filtration process will remove most of the organic precursors. As the maximum contaminant level (MCL) for the trihalomethane compounds is lowered by regulations, the water system will have to consider alternate methods of disinfecting the water. The points of application of chlorine, for example, can be moved from prechlorination to post-chlorination and alternate chemicals can be used for pretreatment of the raw water such as chlorine dioxide or potassium permanganate.

2. Start-up

The application of chlorine should be started as soon as the flow of water through the plant begins. It is important that the chlorine have as much contact time with the water as possible. If a plant has been shut down for a period of time, the chlorine residual in the plant effluent water should be checked and, if necessary, additional chlorine should be added and plant start-up should be delayed at least 20 minutes to allow for adequate contact time before the water is available to the consumer.

3. Normal Operations

Normal operations of the chlorination equipment is continuous when water is being produced. Chlorine normally is applied to the water at the inlet to the clearwell or at a point which is farthest from the outlet of the dearwell. The clearwell should have baffles to prevent short circuiting of the treatment. The operator should have sufficient chlorine available so containers can be changed or, in the case of liquid solutions, be refilled before there is any interruption in the treatment. Normal operations should include all safety precautions to prevent injury to the operator or the public. Refer to Section 2.0 of this chapter for precautions.

4. Monitoring

The testing for chlorine residual should be performed, as a minimum, on a daily basis at very simple unmanned facilities such as wells. The chlorine residual in the remote sections of the distribution system should be tested on a daily basis. In more complex treatment systems where the water quality is subject to frequent changes, the testing should be performed more frequently; in some cases, chlorine residual monitoring and recording equipment and paced feed rates are necessary.

The chlorine residual at the effluent of the treatment facility should be compared with the chlorine residual in the distribution system. The chlorine feed rate should be adjusted to maintain a detectable residual of free chlorine residual (in the recommended amount of at least 0.2 mg/L) in all parts of the distribution system. Many distribution systems which are large and spread out may have installed additional chlorination facilities to maintain a detectable residual of free

chlorine residual, in the recommended amount of at least 0.2 mg/L, throughout the system. These chlorination facilities must be monitored daily for proper operation and rate of feed.

5. Records

It is important to maintain records of the operation of the treatment facilities to provide assurance that the water is meeting the requirements of the Safe Drinking Water Act at all times. The results of tests for chlorine residual, both at the treatment facilities and in the distribution system, are the best evidence of meeting this requirement. The water supplier should develop a form for recording these results.

6. Maintenance

Chlorination usually is accomplished by either gas chlorinators, hypochlorinators or chlorine dioxide generators.

a. Gas Chlorinators

On a daily basis chlorinators should be inspected for proper operation and leaks. The items to be checked should include injector water supply pressure, injector vacuum, chlorine supply pressure (after the pressure regulating valve), feed rate on rotometer tube. The chlorine residual should be checked and recorded. The weight of the chlorine cylinders should be recorded (check to see that the change in weight corresponds with the feed rate on the rotometer). Determine when the cylinder is approaching empty, when full cylinders are available, and when cylinders must be changed.

If an automatic chlorine residual analyzer (which adjusts the feed rate as the flow rate changes) is in use, check the actual chlorine residual, sample water flow, and add reagents if required. Change recording chart if necessary.

On a weekly basis check chlorinator feed rates through the full range of its capacity, clean any filters, and check operation of all valves. If automatic equipment is in use, check the operation through the full range of its capabilities, clean filters, clean water sample line, clean all dilution wells and baffles, fill buffer reservoirs, check sample and buffer feed pumps for proper operation, and generally clean all equipment hoses and reservoirs.

On a monthly basis, exercise all chlorine valves, inspect ventilation, heating, and lighting equipment for proper operation. Check the chlorinator vent line for obstructions such as insect nests, inspect the vacuum system for leaks, and perform other maintenance according to the manufacturer's recommendations. The automatic chlorine analyzer should be maintained according to the manufacturer's recommendations regarding lubrication, cleaning, and calibration.

Inspect all safety equipment for proper operation including chlorine alarm system and the self-contained breathing apparatus or gas masks.

Some abnormal operating conditions which could occur are:

• Chlorine leak - A chlorine leak is usually detectable by your sense of smell as soon as you arrive at the chlorination location. If a chlorine leak is suspected, do not enter the building or chlorine room without having a backup person with you and without the use of a gas mask or respiratory equipment. Use the ventilator fan to air out the chlorinator room as much as possible. Upon entering the room, turn off the valve at the chlorine cylinder or container first. Allow the chlorinator ejector to continue to operate to clear the chlorine out of the lines. If the leak is in the piping, equipment, or valves, repair the leak and return the system to service.

If the leakage cannot be stopped by shutting off the chlorine cylinder or container valve, it will be necessary to install an emergency kit on the cylinder or container. The supplier of the cylinder or container should be notified in order to provide help in installing these kits.

- Low gas pressure If the chlorine gas pressure drops, it usually is the result of the chlorine container being empty, clogged filters, or closed valves. To correct, replace the container, clean the filters, and check the valves.
- Injector vacuum too low If the injector vacuum drops too low, the chlorinator should automatically shut off. The cause of the vacuum being low is a leak in the vacuum hoses, low water pressure, or clogged ejector.

If there is a vacuum leak, repair the leak. If there is low water pressure, check the source, pump operation, or line strainers. If the ejector is clogged, remove and clean it.

If the above does not correct the problem, check the solution line downstream from the ejector for any restriction such as a collapsed line, partially-closed valve, or a clogged diffuser.

b. Hypochlorinators

Hypochlorinator systems usually consist of a solution tank for the hypochlorite solution and a diaphram-type metered solution pump. The items to be checked include the level of solution in the tank, the strainer on the solution suction line, the diaphram pump, and the discharge line. The diaphram pump has an adjustable feed rate that is used to adjust the chlorine solution feed rate. On a daily basis the solution tank should be filled, the suction line screen should be checked and cleaned, and the operation of the solution pump should be checked. The volume of solution and volume of water added each day should be recorded.

A test for the chlorine residual at the effluent of the facility will indicate if the pump feed rate is at the proper amount. The chlorine residual at the effluent of the facility should be high enough to maintain a detectable residual in the recommended amount of at least 0.2 mg/L throughout the distribution system. If the chlorine residual is too low, the solution pump rate should be increased. If the solution pump rate cannot be increased, then the strength of the solution in the solution tank should be increased by changing the ratio of solution to water.

On a weekly basis, the solution tank should be thoroughly cleaned. Maintenance of the solution pump should be in accordance with the manufacturer's recommendations. On a monthly basis all valves should be checked for proper operation or leaks. All plastic feed lines should be checked for damage, kinking, or clogging. The abnormal situation would be the failure of the solution pump. A spare solution pump should be available to immediately replace the failed pump. If the pump motor is operational, the pump can be rebuilt by replacing the diaphram and the suction and discharge valves. Unless the pump body is damaged, these parts usually restore the pump to proper operation.

B. Chlorine Dioxide

1. General Description

Chlorine dioxide is generated by the reaction of a chlorine solution with a sodium chlorite solution in a chlorine dioxide generating tower. The benefits of a chlorine dioxide disinfectant over chlorination are the trihalomethane compounds are not formed, chlorine dioxide is more effective than chlorine in killing bacteria and viruses at a pH range from 8 to 10, chlorine dioxide does not combine with ammonia, and chlorine dioxide maintains a more stable residual in the distribution system. The equipment required for the generation of chlorine dioxide is the same chlorinator unit used to feed chlorine, a metered solution pump for sodium chlorite, a solution tank for the sodium chlorite solution, and a chlorine dioxide generator.

2. Start-up

The start of the chlorine dioxide generator coincides with the start-up of the treatment facilities. The operator should determine that the chlorine feed rate is adequate and that the sodium chlorite solution tank is filled. The generation of chlorine dioxide is evidenced by the yellow-green color of the water as it rises in the generator. Chlorine residual tests are taken by the same procedures used for chlorination.

3. Normal Operations

Normal operations are the continuous feed of chlorine dioxide to the system. The rate of feed can be increased by increasing both the chlorine and the sodium chlorite feed rates.

4. Records

Records for the application of chlorine dioxide are the same as chlorine except the quantity of sodium chlorite used is also recorded.

5. Monitoring

Monitoring of the chlorine dioxide application consists of the chlorine residual tests. The rate of feed for both the chlorine and sodium chlorite solution can be increased or decreased as necessary to maintain a detectable chlorine residual in the recommended amount of at least 0.2 mg/L in all parts of the distribution system.

6. Maintenance

There is no additional maintenance of the chlorine dioxide system over the maintenance of a chlorinator and a metered solution feed pump.

7. Safety Precautions

Sodium chlorite is supplied as a dry powder and is very combustible around organic compounds. Whenever spills occur, the sodium chlorite should be neutralized with water. When fires occur, they should be smothered with soda ash. Do not spray water into a burning drum because it may cause an explosion.

C. Other Disinfection Systems

There are other disinfection systems available for the treatment of water supplies, such as ozone and ultraviolet. At the present time, these systems are not widely used, usually because of the relatively high cost of operation and the lack of any simple test to measure the effectiveness of the system. In addition, water is subject to recontamination in the distribution system and these two methods do not provide any residual disinfecting capability to destroy bacteria after it leaves the treatment facility. If systems such as these are in use, the operation and maintenance procedures should be developed based on the manufacturer's recommendations.

2.3 Fluoridation

A. General Description

The effect of fluoride in public water supplies is to reduce dental cavities. There have been many studies to support this theory and it is generally accepted by water suppliers and by the public. These studies have established that water with a fluoride content of about 1.0 mg/L

causes a decrease in the number of cavities in children's teeth. Excessive fluorides in drinking water may produce mottling of teeth. The maximum contaminant level (MCL) for fluoride is based on the annual average of maximum daily air temperatures. (See the MCL established by the Georgia Rules for Safe Drinking Water, Chapter 391-3-5.) The reason air temperature is used is because in warmer climates people drink much larger quantities of water than in the colder climates. This results in a larger daily intake of fluoride. Fluoride is available for use in water systems in three common chemical compounds: sodium fluoride, hydrofluosilicic acid, and sodium silicofluoride.

- B. Sodium fluoride (NaF), a white, odorless material available in powder or crystal form, has the unique quality of solubility of 4.0 grams per 100 ml in water temperatures normally encountered in water treatment practice. The relative constant four percent solubility of sodium fluoride makes it ideally suited as the basis of design for the saturator type feeder where water slowly is passed through a bed containing a large amount of sodium fluoride.
- C. Hydrofluosilicic acid (H₂SiF₆), a 20 to 35 percent aqueous solution, is a clear, straw colored, fuming, corrosive liquid with a pungent odor and the ability to irritate skin. Because hydrofluosilicic acid contains a relatively high proportion of water, the shipping costs can be quite high for large quantities. Attempts to dilute the acid are subject to errors in measuring so it is better to use the acid undiluted from the container. If the acid is too concentrated for the solution feeder to handle, then weaker solutions of other chemical compounds are generally indicated. If the acid must be diluted, care should be taken to avoid formation of precipitate of silica.
- D. Sodium silicofluoride (Na2SiF6) is converted from hydrofluosilicic acid to a dry material containing a high percentage of available fluoride. This material has eliminated the water content of the hydrofluosilicic acid, thus reducing the shipping costs. Sodium silicofluoride is a white, odorless, crystalline powder. Its solubility varies from 0.44 grams per ml at 0°C to 2.45 grams per 100 ml at 100°C so it is not suited for use in saturators. Sodium silicofluoride can be fed with a dry chemical feeder into a solution tank with a mixer and the solution is applied to the water supply.
- E. Start-up

The start-up of chemical feeders, either dry feeders or solution pumps, should be simultaneous with the start-up of the water supply pumps, because the feeding of fluoride to water in the piping system when the water supply pumps are not running could result in harmful overfeed to the consumers. Most chemical feeders are normally wired into the control wiring of the water supply pump.

F. Normal Operations

The normal operation is to provide feeding of the fluoride compound to the finished water output of the treatment facility or well. Application should be at a point where all of the water produced passes. If there is multiple output and there is no common point, then a separate feeding arrangement will be necessary for each location. The point of application should be after the filtration process and as far away as possible from any other chemical applications which contain calcium since this could cause the loss of fluoride by precipitation.

G. Chemical Feed Equipment

1. Where saturator chemical feed equipment is used, the operation is similar for either upflow or downflow saturators. In downflow saturators, the water passes through a layer of sodium fluoride which is supported by layers of sand and gravel. There is an inverted cone on the bottom of the container which houses the solution pump suction line. The water dissolves the sodium fluoride to a four percent concentration. As the water passes through, the sand, gravel, and cone prevent particles of undissolved sodium fluoride from passing into the water system.

In the upflow saturator, the water is distributed to the bottom of the solution tank where it passes up through a layer of sodium fluoride. As it passes through the sodium fluoride, the water attains a four percent concentration of fluoride. The flow rate of water is slow enough so the undissolved sodium fluoride remains on the bottom of the solution tank. The solution pump suction is in a floating strainer and foot valve on the surface of the liquid.

- 2. Where a dry chemical feeder is used, the chemical is usually sodium silicofluoride and the feeders are either volumetric (by volume) or gravimetric (by weight) to deliver a uniform amount of fluoride chemical per unit of time. The dry chemical drops into a solution tank where it is mixed with water, assisted by either a water jet or a mechanical mixer. A mechanical mixer is more dependable and provides better dissolution of the fluoride in the water. The water in the solution tank then flows, either by metering pump or by gravity, to the point of application.
- 3. When hydrofluosilicic acid is used, it is fed by a metering pump. Metering pumps are available in several types. The most common are: a diaphram pump with a flexible diaphram that moves to force a specific amount of liquid out of the pump chamber and alternately moves in the opposite direction and draws the liquid into the pump chamber from a reservoir; a piston metering pump with a piston that alternately moves forward and back, the forward stroke forcing the liquid out of the chamber and the back stroke drawing in liquid from a reservoir; and peristaltic pumps which force uniform amounts of liquid to flow through a flexible plastic tube by passing movable rollers along the tube. The diaphram metering pump is the most common because it is economical to purchase and maintain. The piston metering pump is usually more rugged for larger installations. The peristaltic pump has the advantage of providing more uniform flow, eliminating the pulses caused by the diaphram and piston type metering pumps. The suction line of the metering pump should be run into the acid carboy, which should be vented to the outside since the fumes from the hydrofluosilicic acid are pungent and corrosive.
- H. Fluoride Feed Rates

The fluoride level in a water supply is accomplished by adding the proper concentration of a fluoride chemical at a consistent rate. Listed below are examples of calculations to determine the feed rates for the various chemical compounds.

To make these calculations, the available ion and the chemical purity must be known. Your chemical supplier should provide this information to you; however, listed below are the common values:

Chemical	<u>Formula</u>	Available Ion Concentration	<u>Purity</u>
Sodium Fluoride	NaF	0.452	98%
Sodium Silicofluoride	Na_2SiF_6	0.607	98.5%
Hydrofluosilicic Acid	H_2SiF_6	0.792	23%

The fluoride feed rate formulas are:

Fluoride Feed Rate (lb/day) = $\frac{\text{dosage (mg/L) x capacity (MGD) x 8.34 lbs/gal}}{\text{Available fluoride ion x chemical purity}}$

Fluoride Feed Rate (lb/min) = $\frac{\text{dosage (mg/L) x capacity (qpm) x 8.34 lbs/gal}}{1,000,000 \text{ x available ion x chemical purity}}$

Examples of these calculations for each chemical compound are:

1. For Sodium Silicofluoride

Example: A water system has a daily average production of 695 gpm and the city wants to have 1.0 mg/L fluoride level in the finished water. The natural fluoride level is less than 0.1 mg/L. Find the fluoride feed rate using sodium silicofluoride:

a. Convert the plant rate to MGD

 $\frac{695 \text{ qpm x } 1440 \text{ min/day}}{1,000,000} = 1.0 \text{ MGD}$

b. Find the fluoride feed rate

Fluoride Feed Rate (lbs/day) = $\frac{\text{dosage (mg/L) x capacity (MGD) x 8.34 lbs/gal}}{\text{available fluoride ion x chemical purity}}$

Fluoride Feed Rate (lbs/day) = $\frac{1.0 \text{ mg/L x } 1.0 \text{ MGD x } 8.34 \text{ lbs/gal}}{0.607 \text{ x } 0.985}$

Fluoride Feed Rate = 14.02 lbs/day

Therefore, it takes about 14 lbs of sodium silicofluoride to treat 1.0 MG to a concentration dose of 1.0 mg/L.

2. For Hydrofluosilicic Acid

Example: What is the fluoride feed rate if the plant rate is 1.0 MGD, the natural fluoride level is 0.2 mg/L, and the desired fluoride level is 1.2 mg/L?

Fluoride Feed Rate (lbs/day) = dosage (mg/L) x capacity (MGD) x 8.34 lbs/gal available ion x chemical purity

Fluoride Feed Rate (lbs/day) = $(1.2 - 0.2) \text{ mg/L x } 1.0 \text{ MGD x } 8.34 \text{ lbs/gal}}{0.79 \text{ x } 0.23}$

Fluoride Feed Rate = 45.8 lbs/day

Thus, it takes 45.8 lbs. of 23 percent hydrofluosilicic acid to treat 1.0 MG of water at a dosage of 1.0 mg/L.

3. For Sodium Fluoride Saturator

A sodium fluoride saturator is unique in that the strength of the solution formed is always 18,000 ppm. This is due to the fact that sodium fluoride has a solubility which is practically constant at 4.0 grams per 100 milliliters of water at temperatures generally encountered in water treatment. This means that each liter of solution contains 18,000 milligrams of fluoride ion (40,000 mg/L times the percent available fluoride (45 percent) equals 18,000 mg/L).

This simplifies calculations because it eliminates the need for weighing the chemicals. All that is needed is the volume of solution added to the water. For calculated dosage, this volume is provided by a meter on the water inlet of the saturator.

Fluoride Feed Rate (gpm) = $\frac{\text{capacity (gpm) x dosage}}{18,000 \text{ mg/L}}$

Example: A water plant produces 1.0 MGD and has less than 0.1 mg/L of natural fluoride. What would the fluoride feed rate be to obtain 1.0 mg/L in the water?

Fluoride Feed Rate (gpd) = <u>capacity (gpd) x dosage(mg/L)</u> 18,000 mg/L

Fluoride Feed Rate (gpd) = 1,000,000 gpd x 1.0 mg/L18,000 mg/L

Fluoride Feed Rate = 55.6 gpd

I. Records

Records of the operation of the fluoride chemical feed equipment should be kept on a daily basis. The records should show the quantity of the chemical applied each day and in the case of a saturator, the gallons of water fed through the saturator. In all cases, the records should contain enough information so the total amount of fluoride applied can be determined. The results of analysis for fluoride in the system should be recorded daily.

J. Monitoring

A sample should be taken from the system and an analysis of fluoride should be made in accordance with an accepted and approved method. The tap at the sample point should be run long enough so the sample is representative of the water in the main. Water samples should be taken and analyzed at least daily.

K. Maintenance

The proper maintenance of the fluoride feed equipment will insure the continued normal operation. The maintenance of the equipment always should be in accordance with the manufacturer's recommendations. The basic equipment used for feeding fluoride is the solution metering pump, the dry chemical feeder, and the mechanical mixer. The maintenance of these units generally consists of keeping the equipment clean and lubricated.

Electric motors usually come with a prescribed schedule for lubrication and many small motors do not require any lubrication. The right type and amount of lubrication is important. Gear boxes used for speed reduction usually require filling with a proper gear oil or lubricant.

Keeping the equipment clean and operative is of prime importance since the fluoride chemicals are very corrosive and tend to build up precipitates which interfere with the flow of water. Spare parts for solution pumps should be kept on hand and a spare pump should be available for use when a pump is being repaired.

L. Safety Precautions

Fluoride compounds are very corrosive and the fumes from hydrofluosilicic acid are pungent and irritating to the skin. The operators always should wear protective safety gear when handling fluoride chemicals. In the dry state, fluoride is dusty and respirators should be worn. Care should be taken that the dust does not get into any food consumed by the operators. When handling hydrofluosilicic acid, rubber gloves and a face shield should be used to protect against splashes on the face, hands, or arms. Any spills should be washed away with large amounts of water.

M. Abnormal Conditions

Overfeed incidents - There is always the potential for overfeeding; however, most overfeeds are not of serious consequence but must be recognized and corrected. In the case of serious overfeeds which produce concentrations greater than 2.0 mg/L, EPD must be notified.

2.4 Softening

A. General

Water, the universal solvent, in its flow through the ground and over the surface washes away and dissolves minerals which become a part of the water supply. Some of these dissolved minerals such as calcium and magnesium cause hardness in the water. Customers frequently complain about the hard water, even though it is not considered a health hazard. It does cause a buildup of mineral scale (usually calcium) in cooking utensils and spots on crystal glassware. This same scale builds up on the insides of hot water tanks, boilers, and homeowner and utility water pipes. This restricted flow is less efficient, causing a greater expense in energy to pump water.

Soft water, more effective in the washing of clothes, uses less soap and makes clothes appear brighter in color. However, several disadvantages must be guarded against. Soft water is generally aggressive and causes corrosion of metal pipes which can shorten the life of the pipes and household appliances, such as hot water heaters. Health hazards result when toxic materials such as lead and cadmium dissolve in drinking water. Softened by the ion exchange process, water can contain higher levels of sodium. This is of particular concern for people on sodium-restricted diets due to heart disease or hypertension.

There are two major water softening techniques commonly used in water treatment -- the lime-soda ash method and the ion exchange process.

B. Lime-Soda Ash Softening

The lime-soda ash process is used in most larger treatment facilities since the addition of the lime and soda ash must be followed by rapid mix, flocculation, sedimentation, and filtration. This treatment process also produces large quantities of sludge which must be taken care of.

The lime-soda ash method can be used with surface water since it will remove turbidity and color with modifications.

The lime-soda ash method also is effective in the removal of radionuclides from water systems in a manner similar to the removal of hardness. The lime and soda ash are added to the water and combine chemically with the hardness causing calcium and magnesium ions, as well as any radionuclide ions present, to convert into insoluble compounds which will precipitate.

1. General Description

The conventional lime-soda ash treatment is used if there is less than 40 mg/L of magnesium hardness in the water. If the magnesium hardness exceeds 40 mg/L, an excess lime treatment is used to raise the pH to at least 10.8. Soda ash is added to remove the noncarbonate hardness. The water must be recarbonated to minimize or eliminate the formation of scale.

Caustic soda can be used in place of lime and soda ash since it can remove both carbonate and noncarbonate hardness. The advantages are it is easier to handle and creates less sludge. The disadvantage is increased cost.

The lime-soda ash process must have chemical storage facilities, chemical feed facilities, rapid mix basins, flocculation basins, sedimentation basins with sludge collecting equipment, sludge recirculation, dewatering and disposal equipment, recarbonation facilities, and filtration facilities.

The operation of a lime-soda ash treatment plant is very complex and requires a good understanding by the operators of the processes which occur at each phase.

a. The chemical storage facilities must be capable of handling large quantities of lime which may be purchased as hydrated lime (slaked) or quick-lime (unslaked). If unslaked lime is used, then the plant must use special feeding equipment to slake the lime.

Soda ash can be purchased in bags, drums, or in bulk form and normally is fed by a dry chemical feeder.

Slaked lime also is fed by a dry chemical feeder and then mixed with water in a slurry known as milk of lime. This slurry will cake on any surface. The pipes and troughs used to convey the slurry must be cleaned regularly.

Where lime is slaked, tremendous heat is generated so adequate ventilation is required. It also is necessary to have facilities for the removal of grit, which is impurities and undissolved lime.

- b. The chemical feed equipment should consist of dry chemical feeders for hydrated lime and soda ash, and also solution feeders for coagulants or coagulant aids.
- c. The rapid mix basins for lime-soda ash treatment must be large enough for the chemicals to dissolve and mix. This is a slower process than coagulant chemicals. The sludge from the sedimentation basins also is recirculated to the rapid mix basins. If coagulants are used, they can be added to the rapid mix, but better reactions can be obtained if they are added upstream.
- d. The flocculation basins provide and are similar to the flocculation basins used in conventional water treatment.
- e. Sedimentation basins are similar to conventional treatment except they must be equipped with mechanical sludge collection equipment. The sludge is recirculated to the rapid mix basins where it aids in the formation of floc. Excess sludge is disposed of in lagoons or dewatering facilities.
- f. In some lime-soda ash treatment plants, solids contact clarifiers are used in place of the rapid mix, flocculation, and sedimentation basins. These clarifiers have two major zones -- the mixing zone for rapid mix and flocculation, and the settling or clarification zone where the solids settle as the clarified water passes up through a sludge blanket. The sludge blanket aids the settling and clarification process. The effluent water overflows the weirs into the troughs which convey the water to the filters. A certain amount of sludge is retained in

the solids contact unit to form the sludge blanket. The excess sludge is drawn off and recirculated or discharged to waste handling facilities.

- g. Sludge from the sedimentation basins or the solids contact clarifiers is recirculated to the rapid mix basins. The excess sludge is disposed of in lagoons or is dewatered by drying beds, sludge thickeners, vacuum filters, or centrifuges and then is disposed in an acceptable manner (may be by land application or in landfill sites).
- h. The recarbonation facilities add carbon dioxide gas to the softened water to stabilize the water so the excess calcium carbonate (CaCO₃) does not precipitate on the filter media.
- i. The filters used in the lime-soda ash softening plant are identical to those used in a conventional treatment plant.
- 2. Start-up

Start-up of a lime-soda ash plant should follow the flow of the water through the plant by starting the raw water pumps, the chemical feed equipment, the rapid mix and flocculators, the recarbonation facilities, the chlorinators, and high service pumps. The mechanical sludge collecting equipment and the sludge recirculating pumps should be activated. Water quality tests for pH, alkalinity (phenophthalein and total or methyl orange alkalinity), total hardness, and carbon dioxide should be performed on samples from the raw water. The desired feed rates of lime and soda ash can be determined from these tests. A jar test using the additions of lime and soda ash at the calculated feed rates will confirm or indicate necessary adjustments to those rates.

- 3. Normal Operations
 - a. The normal operation of the lime-soda ash treatment plant will involve normal operation of rapid mixers, chemical feeders, flocculators, solids contact units, sedimentation basins, and filters which are described in other parts of this chapter.
 - b. In a lime-soda ash treatment plant, there are large amounts of chemicals which must be stored and fed to the water. The operator should be checking the operation of the chemical feeders and chemical conveying equipment, because lime is very likely to cake and coat on the surfaces it comes in contact with causing a change in the feed rates. The chemicals stored in hoppers can bridge which will change the feed rate. Lime is a very dusty chemical and care must be taken in loading hoppers to prevent the escape of dust. The operator should wear a dust mask and goggles when loading hoppers.
 - c. The operator should check the settled and finished water for pH, alkalinity, total hardness, and carbon dioxide. The results of these tests will indicate the

effectiveness of the treatment processes and the need for any change in feed rates.

- d. The recarbonation facilities are used to stabilize the water, in this case to lower the pH, so the precipitation of calcium carbonate does not occur on the filters or in the distribution system. The normal operation involves checking the diffusers to see that they are not clogged and checking the ventilation system for proper operation
- e. The normal operation of the filters is the same as a conventional treatment plant except the operator must be aware that any precipitate of calcium carbonate can build up on the filter media causing the media to stick together. If this happens, the effectiveness of the filter media is lost. The operator should inspect the filter media to see if the grains are coated with a white scale. The water quality tests of the settled water also will indicate a potential problem. If the calcium carbonate precipitate gets to the filter underdrains, they can become plugged requiring major maintenance on the filters.
- 4. Monitoring

The monitoring of the lime-soda ash softening treatment is to visually observe the water flowing through the process. With experience, the operator will notice the color of the water, the suspended undissolved particles, the formation of floc, the settling rates in the sedimentation basin, the clarity of the sedimentation basin effluent, and the effluent of the solids contact clarifier.

The operator should be able to check the chemical feed rates by weighing of samples taken for a specific time. The operator should monitor the treatment process by frequently taking the water quality tests for pH, alkalinity, total hardness, and carbon dioxide in the raw, settled, and finished water. The operator should monitor the filter head loss and turbidity of the effluent to determine the need for backwashing.

- 5. Records
 - a. Records of all water quality tests should be recorded on an appropriate form indicating the time, date, and location of the sampling point and results of all tests performed.
 - b. A record of the amounts of all chemicals fed should be made together with the feed rates (mg/L) and the chemical feeder settings.
 - c. A record should be made of the amount of water treated, the amount of water used for plant purposes, and the amount of water used for backwashing.
 - d. A record should be made of the amount of sludge pumped to disposal.
- 6. Maintenance

The maintenance of a lime-soda ash treatment facility is basically the same as for a conventional water treatment plant involving chemical feeders, rapid mixers, flocculators, sedimentation or solids contact units and filtration. The additional maintenance requirements for a lime-soda ash plant would be additional checking of chemical feeders and chemical solution feed lines for possible caking and buildup of lime which could change or interfere with the feed rates. The larger volumes of sludge and the recirculation of sludge back to the rapid mix basin would require maintenance of those pumps and pipes used to transport the sludge. At approximately six-month intervals all of the basins should be drained and checked for any buildup of sludge, and the mechanical sludge collecting equipment should be checked for proper operation and wear.

- 7. Operating Problems
 - a. Excess calcium carbonate can pass through the entire softening process to the filters where it coats the grains of the filter media and cements them together. Excess calcium carbonate also can pass through the filter media and coat and plug the filter underdrains. It also can be passed on to the distribution system where it coats the walls of the pipelines causing restricted flow. This can be caused by inadequate mixing, incomplete flocculation, or incomplete recarbonation. If the problem cannot be controlled by adjustments to the softening process, then a solution of sodium hexametaphosphate (0.25 to 1.0 mg/L) can be fed to hold the calcium carbonate in solution.
 - b. Magnesium hydroxide can form a scale on the inside of boilers, hot water tanks, and hot water lines when heated to 140°F or more. This is caused by a magnesium hardness in excess of 40 mg/L. When this occurs, treatment with excess lime is required (pH of 10.8 or higher) to precipitate the magnesium hydroxide out of the water in the solids contact basin or sedimentation basins.
 - c. Carryover of sludge solids from the sedimentation basins or solids contact units can occur due to improper hydraulic loading, such as forcing larger quantities of water through the units, short circuiting, or sudden changes in the water quality. To prevent the carryover of solids, reduce the hydraulic loading or improve the settling characteristics of the floc. Recirculation of settled sludge to the rapid mix basin may improve the floc and the settling of the solids.
 - d. Unstable water will produce scale deposits (pH too high) or corrosiveness (pH too low). Recarbonation or other stabilization techniques will control these problems.

C. Ion Exchange Softening Process

The ion exchange method removes the hardness ions from the water by replacing them with sodium ions which do not cause hardness. The ion exchange materials are usually polystyrene resins. As the water passes through the resin, the calcium and magnesium ions transfer from the water to the resin. When the sodium ions available on the resins are exhausted, the resin must be regenerated by passing a brine (salt water solution) through the resin. This is the same

process which commonly is used in home water softeners, smaller water supply treatment plants, and for ground-water sources.

The ion exchange softening process also will exchange radium ions for sodium ions, thereby removing radionuclides from the water. Removing uranium from water by the ion exchange process will require the use of anionic (negatively) charged resins. A mixture of sodium chloride and sodium bicarbonate are used for regeneration of the anionic exchange resin.

The ion exchange softening process also will exchange nitrate ions for chloride ions in the resin bed. The selection of the resin should be based on the manufacturer's recommendations and/or pilot testing.

1. General Description

The ion exchange process is a softening method where the water containing calcium and magnesium is passed through a filter-like media which has the ability to attract the calcium and magnesium ions and exchange them for the sodium ions. The filter media is a polystyrene resin commonly referred to as resin. A natural material known as glauconite or green sand also has been used in ion exchange softeners. When the softening media (resin) has exchanged all sodium ions, it must be regenerated by washing it with brine which washes away the calcium and magnesium ions and deposits sodium ions.

As long as the sodium ions are available on the resin, the ion exchange softening process will produce water with a near zero hardness. Since some hardness is desirable and to reduce the cost of treatment, some water normally is bypassed around the softener and blended with the softened water to produce a water having a hardness of 75 to 100 mg/L, or four to six grains per gallon.

The ion exchange softening units are relatively compact and inexpensive compared to the space and cost of the lime-soda ash treatment. The only chemical used in the ion exchange process is salt which is safe and easy to use and handle, and with proper operation, represents no danger to the customer. The operation of the ion exchange units is usually an automated process which requires only routine inspection and maintenance. The corrosiveness of the brine does require some careful attention to prevent its effects on the equipment and controls.

The ion exchange process is not effective in treating surface water because the suspended solids, algae, and other organic materials in the water will foul the resin. The ion exchange process does not produce any sludge material; however, the spent brine from the washing process must be considered a wastewater and must be properly disposed in a manner acceptable to EPD.

2. Start-up

Prior to start-up, each unit should be put through a regeneration cycle so the resin is completely recharged with sodium ions. This then sets the beginning of the automatic cycles for normal operation. Where there are multiple softening units, the start-up should be staggered by at least one hour and preferably two hours so the backwash cycle of any two units does not occur at the same time.

Chlorination and the well pumps should be activated simultaneously with the softening units. The start-up of the high lift pumps would be dependent on the clearwell water level and the chlorine residual of the effluent water.

3. Normal Operation

The normal operation of the ion exchange softening units is controlled automatically and is divided into five cycles: softening, backwash, regeneration, slow rinse, and fast rinse.

- a. The softening cycle is the normal flow of hard water into the ion exchange unit until the unit no longer produces soft water. Usually the amount of water treated in this cycle is a calculated and set quantity of water. The amount of water which can be treated in this cycle is based on the amount of hardness in the source water and the calculated amount of hardness which the volume of resin in the unit can exchange. When the calculated quantity of water has been softened, the automatic controls will either sound an alarm, stop the flow of water to the unit, or automatically initiate the backwash cycle. Even on units which are completely automatic, the operator should perform frequent hardness tests on each unit to verify the proper operation of the automatic controls.
- b. When the backwash cycle is called for, either automatically or manually, the effluent valve is closed and the waste valve is opened. The inlet water is directed to the underdrains and flows upward (or in reverse of the softening flow) through the resin. This removes any suspended solids that may have accumulated in the media and loosens the resin that has been compacted by the downward flow. The backwash water flows out of the unit through the inlet piping and is directed to waste.
- c. In the regeneration cycle the concentrated brine is drawn from the salt storage basin and diluted by an ejector to approximately 1 0 percent salt (by weight) and is passed through the brine inlet piping and a distribution system on to the top of the resin. The brine is fed at a slow and continuous rate for approximately 20 to 25 minutes. Adequate contact time for the brine to pass through the media is necessary to completely recharge the media. The brine exchanges the sodium ions for calcium and magnesium ions on the resin.
- d. In the slow rinse cycle the influent water is passed through the brine distributor piping on to the top of the resin bed. Then it flows through the resin bed to waste.
- e. In the fast rinse cycle the influent water is passed through the resin bed to waste to remove any last traces of the brine from the resin bed. This cycle is similar to the filter to waste cycle in conventional rapid sand filters. After completion of the fast rinse cycle, the unit is returned to the softening cycle and the effluent is directed to the clearwell.

- f. A problem with the ion exchange softening unit is the disposal of the spent brine. The spent brine contains calcium chloride, magnesium chloride, and sodium chloride from the regeneration and rinse cycles. These wastewaters can be discharged to public sewers only with the approval of the sewer operating utility or municipality since the large concentration of dissolved solids could upset the sewage treatment plant operations. Other alternative waste disposal methods may be considered. In any case, all discharges must be by a method approved by EPD.
- 4. Monitoring

The operator should perform routine tests at least daily on the influent and effluent water to determine the alkalinity, total hardness, and chloride content. A chlorine residual should be determined on the effluent water. These tests will indicate that the process is operating correctly and achieving the desired results. A Langeliers Index should be determined on the effluent water approximately once per month to determine the stability of the water.

The operator should determine that there is an adequate amount of rock salt available in the salt tank and that adequate water is present for the next regeneration cycle. If the addition of water to the salt tank is not automatic, the amount of water to be added should be adequate for the anticipated number of regenerations of softening units during a 24-hour period.

5. Records

The operator should record at least daily the results of all water quality tests, the amount of water treated, the amount of water used in regeneration and rinse cycles, the number of unit regenerations, the calculated pounds of salt used, the amount of salt added to the salt tank, and the amount of chlorine and other chemicals added.

6. Maintenance

Routine daily maintenance would involve checking all piping for any leaks. Since the brine is extremely corrosive, all leaks and spills should be immediately cleaned up. A daily check should be made on all pumps, meters, and automatic valves for proper operation.

At approximately six-month intervals the softening units should be opened and the amount of resin present should be checked. Add resin if required. The condition of the resin should be checked for iron or organic fouling. The influent and salt distributors should be checked for any damage.

- 7. Operating Problems
 - a. The resins used in ion exchange softening units are expected to last for many years in regard to their ability to attract and exchange ions. As the resin is backwashed, the individual grains are tumbled against each other and against the walls of the unit. This wears away the size of the resin grains until they become

light enough to be washed away with the backwash water. This lost resin must be replenished periodically.

- b. The use of high doses of chlorine in the influent water can oxidize the resin, thus reducing its ability to exchange ions.
- c. The presence of iron in the raw water can precipitate as iron oxides within the resin bed. Once this reaction occurs, the brine will not remove the iron oxide. Pretreatment to remove iron will prevent this problem.
- d. Turbidity, organic materials, and bacterial slimes can adversely affect the resin by coating the resin particles, resulting in loss of ion exchange capacity and excessive head loss. When this condition exists, conventional treatment prior to softening must be provided.
- e. The ion exchange softening process does not change the pH or alkalinity of the water, but the removal of all calcium carbonate hardness produces a water which is unstable and corrosive. The effluent water should be blended with hard water, or chemicals must be added to provide stabilization.

2.5 Aeration

Aeration is the introduction of air into water, naturally or by the treatment process. A good example of natural aeration is the tumbling of water over rocks in a stream bed. The turbulence brings the air into contact with the water and the air dissolves into the water.

The induction of air into water can help oxidize iron, manganese, and certain types of tastes and odors; raise the oxygen level in the water; reduce the carbon dioxide, hydrogen sulfide, and methane; and remove volatile organic compounds. Excess carbon dioxide in water can cause corrosion, can make iron removal more difficult, and can inhibit the lime softening process.

Hydrogen sulfide is a poisonous gas which can be dangerous in water treatment. It has a rotten egg odor and affects the taste of coffee, tea, ice cubes, and other foods. The gas is corrosive to metals and will tarnish silverware.

Methane, commonly called swamp gas, is flammable and explosive and will impart a garlic-like taste into water.

Iron and manganese in water can cause a metallic taste in addition to staining clothes and plumbing fixtures.

Some tastes and odors in water can be removed or reduced by aeration if they are caused by volatile substances which are readily oxidized. Many taste and odor causing substances will only be partly reduced by aeration and must be removed by other processes.

An increase in dissolved oxygen in water is beneficial because it improves the taste of otherwise flat tasting water from the lower portion of lakes or reservoirs. A large amount of dissolved

oxygen in water is called saturation and this can cause problems in the treatment process such as corrosion, floating floc, and air binding of filters. The turbulence of a cascade type aerator can remove excess dissolved oxygen to the atmosphere. There are numerous volatile organic chemical compounds in water as a result of industrial pollution which are known or suspected carcinogens. Also, chlorine tends to react with certain natural organic materials to form trihalomethanes

A. General Description

Each type of aerator has its own characteristics and may be more effective for one constituent than another. There are many different types of aerators but they basically fall into the following categories:

1. Water into Air Aerators

In this type of aerator, the water flow is broken into small drops and falls through the air, creating intimate contact with the air. Different types are:

- <u>Cascade Aerator</u> In a cascade aerator the water flows down a series of steps or circular rings stacked together with a central vertical feed pipe;
- <u>Cone Aerators</u> A cone aerator is similar to stacked pans except the water flows from one pan to the next by means of specially-designed cone-shaped nozzles;
- <u>Slat and Coke Tray Aerator</u> The slat and coke tray aerator usually has three to five trays which have spaced wooden slats. The trays are filled with pieces of coke rock, ceramic balls, or limestone. This creates a larger contact area between the air and the water;
- <u>Draft Aerator</u> A draft aerator is similar to the slat and coke tray aerator with a positive upward air flow from a blower introduced at the bottom of the aerator. An induced draft aerator has a top-mounted blower which pulls an upward flow of air from the bottom of the aerator;
- <u>Spray Aerator</u> A spray aerator disperses water out into a fine spray that falls through the air in a fountain effect. These are sometimes located within a structure to prevent windblown losses and reduce freezing problems. A spray aerator also may incorporate the effects of a cascade and a draft aerator for maximum effect.
- 2. Air into Water Aerators

This type of aerator mixes air into the water by either diff users or draft tubes. They are:

- <u>Diffuser Aerator</u> A diffuser aerator releases tiny bubbles of compressed air into the water, usually near the bottom of an aeration tank. These diffusers are usually mounted on a manifold pipe at a regular spacing to provide a rolling type mixing pattern to the water;
- <u>Draft Tube Aerator</u> A draft tube aerator is a submersible pump with an air intake pipe. A partial vacuum is created by the eye of the impeller. The air and water are mixed by the turbine impeller and then discharged to the aeration tank.

3. Combination Aerators

This type of aerator produces air mixed in water by mechanical means or by applying water to compressed air or diffusing air into a pressure pipeline. They are:

- <u>Mechanical Aerators</u> Mechanical aerators have a propeller mixing blade which is driven by a motor. The rapidly turning blade causes a violent mixing of the air and water. These have several different configurations: surface, submerged, combination (two blade), and draft tube;
- <u>Pressure Aerators</u> Pressure aerators are of two basic types: water is sprayed into high pressure air within a pressure tank and air is diffused into water directly in a pressure pipeline.
- 4. Air strippers

This type of aerator forces air to flow upward through water which is flowing downward through a packed bed of small pieces of material. Packed tower air strippers which are a vertical column partially filled with small pieces of material use this process. As the flow of water trickles down through the material there is a countercurrent flow of air from a blower upward through the material.

B. Start-up/Shut-down

The start-up of aeration units should coincide with the start-up of the flow of water through the treatment process. With forced or induced draft the countercurrent flow of air should be established before the flow of water starts through the aerator. When the aerator is shut down the blower should continue to operate until all water has passed through the aerator facilities. On shut-down, all water pipes and bottom collection chambers should be effectively drained to prevent freezing.

C. Normal Operations

Normal operations should include visual inspection of the equipment for any damage due to corrosion.

D. Monitoring

During operation of the aeration facilities the following tests should be made:

- DO (dissolved oxygen);
- pH;
- Temperature;
- CO₂ (carbon dioxide);
- Manganese;
- Taste and odor.

The DO test and the temperature will indicate possible over or under aeration of the water. The pH can be used as an indication of CO_2 removal or of the best pH range for removal of H_2S or iron and manganese.

Frequency of testing would depend on the normal variations in the source water. In water with very little variation, daily testing may not be necessary.

Where aeration is used to remove volatile organic compounds, the analysis should be made by a laboratory certified for volatile organic compounds and, if necessary, for vinyl chloride. Analyses should be done a minimum of once each calendar quarter.

E. Records

Records should be kept for the number of hours of operation, the results of all water quality tests, and any major maintenance or operational problems.

F. Maintenance

The operator should maintain the pumps and blowers according to the manufacturer's recommendations. The operator should visually inspect the aerator for damage due to the corrosive atmosphere such as eroded paint, rust, and rotting of wooden parts. All damaged parts should be replaced as soon as possible and painted surfaces should be restored. Caution: all paint used must be approved by EPD and be certified as meeting the NSF Standard 61. The paint shall not transfer any substance to the water which will be toxic or cause foul tastes or odors.

- G. Operation Problems
 - 1. Too much dissolved oxygen (DO) can be added resulting in super-saturation which can cause corrosion of tanks and pipes, floating floc in clarifiers or sedimentation basins, and false clogging of filters. Monitoring of DO and temperature will alert the operator to this problem. As the temperature increases, the saturation concentration for oxygen in water decreases.
 - 2. The growth of algae and slime on the aerators may occur during the summer months. These can be controlled by the addition of copper sulphate, chlorine, or other suitable chemicals.
 - 3. Where diffusers are used, they can become partly clogged from dust, oil, debris, or chemical deposits. This can be prevented by cleaning air filters, not over-lubricating the blowers, and preventing the backflow of water into the diffusers. Diffusers should be cleaned according to the manufacturer's recommendations.

2.6 Adsorption

A. General

Water contains various organic compounds which can cause color, tastes, and odors. The threat to public health also is a concern in regard to organic compounds, particularly those compounds created by the reaction of chlorine with certain organic compounds (mostly

humic materials) and to certain man-made organic compounds such as insecticides, herbicides, and cleaning solvents.

The naturally occurring compounds enter the water supplies due to the decay of animal and vegetable matter on the watersheds of surface supplies. The insecticides and herbicides present in the runoff from agricultural land and the man-made compounds, frequently found in ground-water sources, are the result of accidental spills, discharges, and uncontrolled disposal. Organic chemicals can be partially removed by using chlorine or potassium permanganate to oxidize the compounds or by aeration, by coagulation/flocculation, by sedimentation, and by filtration; however, these processes cannot remove some organic compounds as efficiently as adsorption.

Adsorption is the use of activated carbon for organics removal. Activated carbon is created by heating carbon (usually bituminous or lignite coal) to very high temperatures in the presence of steam. This creates a very porous surface on the particles whose surfaces attract and hold organics. Once the surface of the particles is covered with organics, it loses its ability to adsorb and must be replaced with fresh carbon.

Activated carbon is available as powdered activated carbon (PAC) and granular activated carbon (GAC). PAC typically is added to the treatment process, usually as near the beginning as possible to provide the greatest contact time, and is removed by the filters to prevent carryover to the system. It usually is added only to the water for control of tastes and odors when necessary. GAC typically is used permanently in the treatment process as a filter material or as the media in GAC contactors for the removal of specific compounds such as trihalomethanes.

B. <u>Powdered Activated Carbon (PAC)</u>

- 1. General Description
 - a. PAC is a very fine dusty material which must be stored and handled with care. This material normally is purchased in 50-lb. bags or, at very large installations, it may be purchased in bulk. The hopper of the dry chemical feeder should be equipped so a bag of carbon can be hung on the open door of the hopper. The top of the bag is slit and the door is closed causing the bag to empty inside the hopper controlling the dust. The dry chemical feeder drops the dry material, at an adjustable rate, into a mixing tank where it is mixed into a slurry with large amounts of water. This slurry should be conveyed to the point of application as quickly as possible to prevent the carbon material from settling out and clogging pipes or troughs.
 - b. The PAC should be applied to the raw water or the rapid mix basin if possible and always should be fed ahead of any chlorination, because the chlorine will diminish the effectiveness of the PAC and the PAC will diminish the effectiveness of the chlorine. If possible, prechlorination should be discontinued when feeding PAC.
 - c. The rate of feed for PAC should be determined by means of a modified jar test. A typical jar test procedure for PAC is listed below:

The stirring apparatus and all critical glassware should be cleaned with a nonscented detergent and rinsed thoroughly with odor-free water (see <u>Standard Methods for the Examination of Water and Wastewater</u> for the method to produce odor-free water). One-liter samples of the raw water are then dosed with varying amounts of a well-shaken stock PAC suspension, such as 5, 10, 20, and 40 mg/L. The stock solution is prepared by adding one gram of PAC to one liter of odor-free water. Each milliliter of this solution when added to a one liter sample of raw water is equal to a dosage of 1 mg/L. The four dosed samples and a fifth sample to which no PAC is added are stirred for a time period that approximates the contact time the PAC will have with the water in the plant. At the end of that time, each sample is filtered through glass wool or filter paper to remove the PAC. The first 200 ml of each sample through the filter is discarded and the remainder subjected to the threshold odor test to arrive at a threshold odor number (TON) for each sample. As in all jar testing, the laboratory trials should simulate plant conditions as closely as possible.

Experience has indicated that plant scale application is more efficient than the jar test procedures, so the operator should start with the most efficient jar test result and then gradually reduce it. The threshold odor test should be conducted at least daily while PAC is being fed to determine if changes in the feed rate are required.

2. Start-up

Before starting the feeding of PAC, the jar test should be done to determine the beginning dose rate, and the prechlorination should be discontinued. Starting would consist of filling the feeder hopper, starting the flow of water in the mixing chamber, starting the solution feed pump and/or opening valves, and setting the indicated dose rate.

3. Normal Operations

Normal operations would be to refill the feeder hopper as necessary, adjust the dose rate as indicated by subsequent threshold odor tests on the filter effluent, checking mixing chamber and pipes or troughs for clogging, and cleaning up any carbon dust.

4. Monitoring

Monitoring consists of the threshold odor test on the filter effluent, making visual observations of the presence of carbon in the water at various locations in the treatment process. For example, it is desirable for most carbon to be settled out before the filters. Changes in the coagulant dose rate usually can correct this problem. The filters should be watched for shorter than normal filter runs since the PAC will cake on the surface of the filter or can penetrate through the filters. An effluent sample should be filtered through a membrane filter paper. If PAC is present, it will darken the filter paper surface. The free available chlorine residual in the plant effluent water must be monitored carefully since the PAC will reduce the effectiveness of the chlorine.

5. Records

Record keeping can provide a guideline for treatment of similar occurrences in the future, particularly for taste and odor problems. A record should include the dates of the occurrence, a description (i.e., "fishy", "septic", "musty", etc.), the treatment changes made, the jar test results, and the amount of PAC fed.

6. Maintenance

Maintenance of PAC feeding equipment is routine clean-up of carbon dust, and clearing of any caking or clogging in hoppers, mixing tanks, lines, or troughs. Routine maintenance of the chemical feeder, the mixer, and the solution pump should be in accordance with the manufacturer's recommendations. All electric motors and switches should be frequently cleaned on the outside. All electric equipment should be explosion-proof, so there should be no unnecessary opening of switch and terminal boxes.

- 7. Operating Problems
 - a. The dust from the fine powder is a fire hazard. The black carbon is hard to remove from clothes and skin.
 - b. PAC can pass through the filters and enter the distribution system causing "black water" complaints from customers.

C. <u>Granular Activated Carbon (GAC)</u>

- 1. General Description
 - a. Granular activated carbon has larger particles and typically is used when carbon is required continually to remove organic compounds. GAC is used like a filter material either in conventional filters or in GAC contactors when a greater depth of carbon is required to provide additional contact time necessary to remove certain organic compounds. GAC normally is purchased in bulk and is placed in the filters or contactors in a slurry form using an eductor system to move the slurry and reduce the dust.
 - b. The length of time the carbon is effective in the removal of organics depends on the amount of organic compounds in the water and the depth or quantity of carbon.
 - c. When the carbon loses its ability to adsorb, it must be removed and replaced with fresh carbon.
- 2. Start-up

When conventional filters are converted to GAC media, the distance from the top of the media to backwash troughs should be recorded so the bed depth can be checked for loss of media. The backwash rates should be carefully established to prevent the loss of media. All other start-up procedures would be the same as a conventional filter (see

Section 2.5 of this chapter). Carbon contactors are similar in operation to pressure filters and would have no special start-up procedures.

3. Normal Operations

The normal operations of a GAC filter or a GAC contactor would be the same as a conventional filter.

4. Monitoring

The operator would monitor the head loss and the turbidity of the effluent water and initiate the backwash procedures when required. The presence of specific organic compounds in the influent and effluent water should be tested a minimum of once per week to determine the remaining bed life of the media. The distance between the top of the wash water trough or some other predetermined reference point and the top of the carbon media should be measured and recorded at least every three months to determine the rate of carbon loss. A check of the backwash water also can indicate the loss of carbon.

GAC manufacturers also can recommend testing procedures to determine the condition of the media. Threshold odor tests should be conducted routinely on raw and finished water as a check on the effectiveness of the filter. Since bacteria are known to thrive in GAC filters, bacteriological examination of filter effluent and final chlorinated water should betaken daily.

5. Records

In addition to the record keeping recommended for the filtration process, records of the results of the above recommended tests should be compiled so the operator is aware of the amount of carbon lost, the estimated remaining bed life of the carbon media, and the effectiveness of the treatment.

- 6. Operating Problems
 - a. The same operating problems as filtration exist for the adsorption by GAC such as bed fouling by mud balls, heavy floc carryover, backwash rates, and filter breakthrough. With GAC filters the coagulation, flocculation, and the sedimentation processes must be operated for the highest reduction of suspended materials.
 - b. The filter flow rates must be kept uniform since fluctuations can cause filter breakthrough which will reduce the contact time with the carbon.
 - c. The backwash rates are critical since too low a rate will under-expand the bed and mud balls will form, and too high a rate will wash the carbon media out causing unnecessary loss of media. The water temperature also should be taken into account when setting the backwash rate since this can affect the percent of bed expansion.

d. The rapid growth of bacteria in GAC beds is a problem. The organic compounds removed by the carbon are food for the bacteria. The chlorine, added before the filters, is adsorbed by the carbon making it less effective in destroying bacteria.

CHAPTER 3 - DISTRIBUTION

The distribution system includes the conveyance of water from the source to the customer including pumping, transmission mains, distribution mains, valves, fire hydrants, customer service lines, and distribution system storage. The operation and maintenance of a water distribution system is a separate function in the operation and maintenance of a water system.

The water must be delivered in the same potable, ready-to-drink condition that it left the treatment facility. To protect the water quality, the water distribution workers must at all times protect the water from any type of pollution or degradation.

3.0 Plans and Records

A. Distribution System Maps

When water mains are installed, a plan of the pipe and fittings must be drawn to establish a record of the facilities installed. This information should be either added to the existing plans or a new plan should be started which would be referenced to the overall system plans. A system should be established for all distribution system plans so that they are of the same scale and fit together to cover the entire system.

The distribution plans become the records of the system showing the date installed, the work order or extension number, the material of the mains, the type of valve, the locations of the mains within the streets or rights-of-way, the location of services, fire hydrants, and valves.

B. Locations of Pressure Zones

On the system plans the normal operating pressures should be indicated at typical locations such as fire hydrants and customer services. These pressures are useful in comparing operating conditions when there is a suspected leak in the system.

Sometimes a water system must be divided into different pressure zones so that customers at higher locations have adequate pressures for the service they desire. Also, customers and the water system mains must be protected from excessively high pressures which could cause damage and break mains and customers' pipes. To establish these pressure zones, the water system may have booster pump stations which pump the water to a higher elevation or the water system may have pressure-reducing stations which reduce the high pressure to a lower, acceptable level. The pressure zones must be clearly marked on the system maps so that inadvertent flow between the zones does not occur. Also, all valves which should normally be closed to separate the zones should be clearly marked on the plans as normally closed.

A description of the operating procedures for each area of the distribution system including pumps, chlorinators, storage tanks and reservoirs, valves and pressure regulating valves should be included in the O & M Plan. This would describe how each part operates with the other parts of the system (i.e., what are the controlling conditions, how is the system monitored, and what records are maintained).

C. Updating and Correcting Plans

When additions or changes are made to the system, the plans should be updated and corrected. Initially, the field personnel such as the maintenance crew or the construction inspector make the changes in pencil on a working set of prints.

D. Production and Pumping Records

A record of the amount of water produced, the chemicals used in treatment, and the water pumped should be kept for the system. These records provide a history of the operation and indicate the demands of the system and the costs of operation. A comparison of records can be used to identify suspected system problems such as increased pumping or treatment costs, or possible loss of water.

These reports should reflect the water taken from all sources of supply such as wells, streams, rivers, and lakes, or purchased from another supplier. The records should indicate the water in the system storage facilities so a daily system use can be developed. A system of keeping records on a month-to-date basis and a daily average use basis can be compared to previous years performance.

3.1 Distribution System Components

A. Transmission and Distribution Mains

There are many materials used in transmission and distribution mains. Some of the more common are as follows:

- Cast Iron Cast iron pipe has been used for water systems for over a century. The older pipe usually had bell and spigot joints which used jute and lead to make a watertight joint. Because of the labor and skills needed to pour a lead joint, this type of pipe is no longer commonly used; however, sometimes repairs are made using poured lead joints. Another factor to consider is the potential for lead contamination in the water. The more modern joints for cast iron pipe and ductile iron pipe are rubber gasketed joints which provide a simple seal which can be easily installed.
- 2. Concrete Concrete pipe has been used for transmission mains because of its long life. It normally is available only in larger diameters and is difficult to make connections. The joints are usually sealed with an 0-ring rubber gasket.
- 3. Asbestos Cement Asbestos cement pipe was used extensively from 1940 to 1980 as a less expensive material. This pipe can release asbestos fibers to the water if the water is aggressive.
- 4. PVC (Polyvinyl chloride) PVC pipe is the less expensive substitute for the ductile iron pipe. This pipe is light in weight and easy to handle and join. It is subject to damage by exposure to sunlight and petroleum products will penetrate the pipe.
- B. Valves

Several types of valves normally are used in transmission and distribution systems. Some are used for normal control and others have special purposes.

- 1. Gate Valves Gate valves are the most commonly used valve in waterworks systems. In a gate valve, there are double discs which by turning the stem are moved downward into the stream of water. When the gates are at the bottom of their movement, a wedge is engaged which spreads the gates apart and forces them against the seats. By turning the stem in the opposite direction, the wedge pressure is released, allowing the gates to move away from the seats. Further turning of the stem raises the gates out of the stream of water to a fully opened position. These valves have proven to be reliable and maintenance free. Maintenance should consist of periodically exercising the valve to keep the threads clear of buildup and checking the valve stem seals.
- 2. Butterfly Valves Butterfly valves frequently are used for the regulation of flow. They have a wafer which rotates in the water stream from fully open to fully closed. The wafer usually has a rubber gasket on its sealing edge. Maintenance consists of replacement of the gasket when it becomes worn.
- 3. Check Valves Check valves are used to control the flow in only one direction. This is normally done by having a hinged flapper which the flow of water will move out of the water flow area. When the flow of water attempts to reverse, the flapper is returned across the flow on to the valve seat stopping the flow. The movement of the flapper is caused by the reverse flow of water, exterior springs, or gravity. There are other configurations of check valves which are designed for special purposes.
- 4. Pressure Relief Valves Pressure relief valves are used to bleed off a flow of water and relieve a high pressure surge condition. Surges of water, such as from the start-up of a pump, can cause high pressures which could damage pipe and facilities. The pressure relief valve usually is kept closed by a spring pushing against the valve disc. The surge of high pressure overcomes the spring, releasing water. As the pressure is lowered to normal, the spring forces the disc closed.
- 5. Pressure Reducing or Pressure Regulating Valves These valves normally are used to maintain a specific pressure on the downstream side of the valve. This action is accomplished by a diaphragm which controls the position of the valve disc. As the pressure on the downstream side drops, the diaphragm opens the disc to allow an increase in the flow of water. As the pressure increases on the downstream side, the diaphragm closes the disc, reducing the flow of water. These valves, because of their constant movement, require frequent maintenance to keep them working and in adjustment. The items needing attention are the strainers, needle valves, pilot valves, and the main diaphragm. These valves frequently are used to control the pressures in various sections of the distribution system.
- 6. Air Relief Valves Air can cause serious pipeline problems by restricting the flow. Air can get into the water system through pumps, packing glands, and leaking joints. These valves are installed at the high points on the system and are simple float valves which release air until the water enters the valve body and raises the float.
- 7. Plug or Ball Valves This type of valve normally is used on customer service lines and consists of a tapered plug or ball which has an orifice the full size of the water stream. When fully open, the orifice is in line with the water stream and, when fully closed, the orifice is at right angles to the water stream and the sides of the plug or ball completely stop

the water flow. These valves are maintenance free and cause little flow resistance when fully open.

- 8. Globe Valves Globe valves cause the water to flow up through an orifice. These valves rarely are used in waterworks systems due to their resistance to flow and high maintenance requirements.
- 9. Altitude Valves Altitude valves are used to control the height of water in distribution storage tanks. These valves open when the system pressure drops and water flows out of the tank. When the system pressure increases, the water flows into the tank until the tank is nearly full. The altitude valve then closes. This valve is very similar in operation and maintenance to a pressure reducing valve. Maintenance consists of checking the strainers, diaphragms, small piping, and needle valves.
- C. Fire Hydrants Fire hydrants are used to provide access to the water system by fire fighting personnel. Fire hydrants have an underground valve and a barrel to deliver the water to hose nozzles above the ground. In cold climates, fire hydrants of the dry barrel type are used because of the danger of freezing. Dry barrel hydrants are designed to automatically drain the water from the barrel when the hydrant is shut off. The hydrant nozzles are usually 2 ¹/₂ inch diameter "steamers" and 4 ¹/₂ inch diameter "pumpers". Fire hydrants usually are manufactured so maintenance of the valve can be accomplished without excavation. All fire hydrants should be equipped with a gate valve on the lateral pipe leading from the water main. This valve will permit the water distribution crews to shut off the hydrant which is damaged or is malfunctioning. Fire hydrants should be flushed and checked at least semiannually for proper operation, particularly that they shut off completely and that the barrel drains.

Fire hydrants should be flushed and checked at least semi-annually for proper operation and for the following items:

- 1. Complete shut off;
- 2. Smooth and ease of operation;
- 3. External parts (i.e., paint, caps, chains);
- 4. Hydrant drain (does barrel drain completely).

Flushing the hydrants also helps to clear any sediment from the distribution system. Fire hydrants require frequent maintenance because they are frequently operated, often by untrained personnel. The parts which often need attention are the valve seats, which are resilient rubber; the valve stem packing, which will leak; and the stems, which become twisted due to turning too hard to shut off.

A cooperative effort between the fire fighting personnel and the water system will help reduce hydrant damage and effect prompt repairs when needed. If a hydrant is taken out of service for repairs, the local fire company or municipality should be given notification. A record book should be kept specifically for hydrants taken out of service. It should contain information on the date the hydrant was taken out of service, the time, the hydrant number and location, the municipality, the employee's name who took it out of service, the name of the person from the municipality who was notified, the date returned to service, the time, and the person notified.

- D. Blow-offs- Blow-offs area tee and valve arrangement at locations where fire hydrants do not adequately flush the system. These are usually dead ends or at locations which, due to topography, require frequent flushing such as at low points. These blow-offs must have their flow directed so that no damage occurs. The blow-offs must be located deep enough to prevent freezing and the discharge pipe should be drilled to permit draining.
- E. Records Records of the locations of all valves, fire hydrants, and blow-offs must be indicated on the system plans. Records of the operation and any maintenance performed must be kept. This information is useful in planning replacement of facilities due to age.
- F. A schedule and scheme for flushing the distribution system should be developed and included in the O & M Plan. The schedule should be at least semi-annual and the scheme should provide for flushing the system from the source towards the extremities of the system.
- G. Schedules should be developed for the following:
 - 1. Valve exercising, maintenance, and replacement;
 - 2. Fire hydrant flushing, inspection, maintenance, and replacement;
 - 3. Meter testing and replacement (includes master meters);
 - 4. Main replacements;
 - 5. Cleaning and inspection of distribution storage facilities including cathodic protection equipment;
 - 6. Section 1, Chapter 3, has additional information regarding maintenance schedules and records.

3.2 Pumps

Pumps are used in water systems to move water or other solutions from one location to another and to add pressure to the water by pumping it to a higher elevation. The common uses of pumps in water systems are well pumps, raw water pumps, chemical feed pumps, backwash pumps, high service pumps, booster pumps, and fire service pumps.

A. Types of Pumps

Centrifugal pumps are the most common type of pump used in water systems. These pumps have the ability to adjust to varying head and flow conditions and are available in a wide variety of configurations manufactured to meet specific conditions.

The other type of pump used is the positive displacement pump which is used for feeding chemicals. These are either diaphragm type or piston type which delivers a measured volume with each revolution or cycle.

B. Capacities and Purposes

The capacities (flow and head) of each type of pump should be matched to its purpose. The capacity of each pump should have been specifically selected when the design of the system or the component was done by the engineer. However, as system components and uses change, so do the capacities and operating conditions for pumps. Therefore, the water system operator should know the flow and head (pressure) the pump was selected for and should periodically test the pumping unit for the present operating conditions. The operator should plot the results of the pump tests on the pump operating curve to determine if the operating point has changed from the design conditions and what the expected efficiency should be.

1. Well Pumps

Well pumps are usually of a vertical turbine configuration and have multiple stages. However, the small water systems that use low capacity wells are usually equipped with submersible pumps. The well pumps can be driven by a shaft extending down the column from a motor located on the surface or by a submersible motor attached directly on the pump and suspended in the well on the end of the column pipe. Well pumps should have their capacity matched to the capacity of the well so that the well is not overpumped, causing excessive drawdown of the aquifer which can cause a deterioration of the water quality.

If the water is lowered to a level near the pump impellers, the pump also can be damaged. The capacity of the pump (flow and head) would have been selected at the time the well initially was pump tested and put in service. As the pumping level would lower due to depletion of the aquifer, the head would increase and the flow would decrease. The operator should be aware of the original conditions and should monitor the pumping water level in the well through the use of an air line or level sensing equipment.

2. Raw Water Pumps

Raw water pumps are used to transfer water from the stream or lake to the treatment facilities. These are usually vertical pumps with an open impeller so they will pump some small pieces of debris. These usually are low head and high capacity. Because these pumps are pumping raw water which contains grit and debris, they are subject to wear which will reduce their capacity. These pumps should be tested periodically for capacity and their efficiencies checked on the pump curve.

3. Chemical Feed Pumps

Chemical feed pumps usually are positive displacement type; however, they can be centrifugal. Since these pumps are comparatively small compared to other pumps and motors, operating efficiency is not usually a consideration for these pumps. Chemical feed pumps must reliably deliver specific volumes of solutions at required pressures; any failures could affect the treatment process. For this reason, the water supplier should have spare pumps and parts for repairs available.

4. Backwash Pumps

Backwash pumps are used to pump finished (potable) water back through the filter bottoms to clean the filter media. These pumps are centrifugal pumps of high capacity and low head. Backwash pumps have only a limited amount of use and pump clean water; therefore, maintenance problems should be very few.

5. High Service Pumps

High service pumps deliver the finished (potable) water from the clearwell to the transmission distribution system. These pumps are usually high capacity and high head. There should be at least duplicate units for reliability. The capacity of these pumps should be equal to the total capacity of the treatment facilities; however, at larger facilities the pumps may be of various capacities so combinations of pumps may be used for operational flexibility.

The water pumped is clean and clear and should not produce any excessive wear on the pump parts. These pumps run for long periods of time; therefore, maintenance of bearings and shaft seals is important. The alignment between the pump and the motor also should be checked since misalignment can cause excessive wear on the pump and motor bearings.

6. Booster Pumps

Booster pumps are the same type of service as high service pumps except they usually are located at various points in the distribution system to pump water to higher pressure zones. The operation and maintenance of these pumps would be the same as high service pumps.

7. Fire Service Pumps

Fire service pumps are the same as high service pumps or booster pumps except these pumps are set with automatic controls to turn on to meet the specific requirements of a large fire flow. These pumps are of high capacity and have only occasional use. The maintenance of these pumps must include checking the controls and actually operating the pumps to verify their reliability of service. All other maintenance is the same as a high service pump.

C. Reports of Operations and Maintenance

A record of the hours of operation for each pumping unit should be maintained. This record can be used for planning preventive maintenance of the units. A record of the maintenance and the cost of repairs will help to evaluate the units when they are being considered for repair/rebuilding or replacement.

D. Monitoring of Pumping Operations

There are many monitoring and control systems for pumping systems. These vary from very simple manual operation to complete automation.

The following are examples of typical monitoring and control systems:

- 1. The simplest system would be a manual on/off switch with an indicating pressure gauge and a water meter. This is typical of many small systems with a well, distribution system, and a tank. The operator usually knows the system very well and can adjust the pumping according to the system pressure.
- 2. A system with a tank level recorder, a pressure recorder, and a flow recorder with automatic pump operation turning the pump on at low tank level and off at nearly full would provide the operator with records and reliability of operation.
- 3. Where there are various pressure zones on a distribution system, the operation of booster pumps is used to transfer water from one part of the system to another. This type of system requires careful monitoring and usually automatic controls. The information on the operating conditions (tank levels, system pressures, pump flows) must be transmitted to an operations control center so the operator can make decisions which will be best for the entire system. There are electronic systems that review all system parameters on a frequent basis and report the data in a usable form at a central point. These systems also collect data for records and reports and, through the use of a computer, can make operating decisions on the system.
- 4. In the treatment process there should be monitoring systems in place to control the operation of the pumps. These can be simple visual observance of levels in the tanks or float level controls which indicate levels or can control the raw water pumps. There also are interlocking controls which will stop the pump operation if the water pressure on the suction side of the pump drops below a predetermined value. Another type of interlock is to shut off the pump if the discharge pressure exceeds a predetermined value. There are continuous monitors for turbidity and chlorine residuals which have the capability of interrupting the pumping operation when certain values are exceeded or not met.

3.3 Distribution Storage Facilities

Distribution storage facilities can be in-ground earthen, concrete, brick, or steel reservoirs, aboveground steel or concrete tanks; or standpipe or elevated tanks. All these storage facilities are used to store treated water for use in the distribution system.

Distribution storage has several purposes such as to provide sufficient water for peak demands which may exceed the pumping capacity, to supply large volumes of fire protection water, and to provide reliability when pumps must be removed from service for maintenance.

- A. Types of Reservoirs and Tanks
- 1. Ground Reservoirs

Ground reservoirs can be concrete, brick, or steel construction at ground level or below ground. Some typical installations are of concrete, masonry, or brick construction. These reservoirs must be properly constructed to prevent potential entry of any contaminants.

2. Ground Level Storage Tanks

Ground level storage tanks have a diameter greater than the height and are constructed of steel or concrete.

3. Standpipe

Standpipes are steel cylinders where the height exceeds the diameter. This tank can hold large amounts of water; however, the pressure does vary depending on the amount of water in the tank.

4. Elevated Storage Tanks

Elevated storage tanks are steel construction elevated on legs or a pedestal. The elevation of the storage capacity makes all of the capacity available at a usable pressure.

B. Maintenance

Maintenance of distribution storage reservoirs will depend on the type of material used for construction. All distribution storage facilities should be drained, cleaned, and inspected annually. The paint system should be inspected for damage, possibly due to ice, and the vent screens should be inspected and repaired to prevent birds and rodents from entering. After cleaning, the interior of the tank or reservoir must be disinfected as required by the Rules for Safe Drinking Water, Chapter 391-3-5. The disinfection should be accomplished in accordance with the procedures outlined in the EPD's Minimum Standards for Public Water Systems.

1. Steel Reservoirs or Tanks

Steel reservoirs should be painted inside and out with an acceptable paint system. The paint system used on the interior surface of the tank must be certified as meeting the NSF Standard 61 and must be acceptable to EPD. Some types of paint can transfer substances to the water which may be toxic or can cause foul tastes and odors in the water.

The paint system will protect the steel structure from deterioration and, thus, extend its useful life. A good paint system should last from eight to 15 years. The atmospheric conditions in the area can have an effect on the life of the paint system. For example, the paint will have a shorter life in industrial areas, and a longer life in rural areas.

Metal tanks are subject to corrosion from unstable water which can shorten the effective life of the paint system and attack the metal. The corrosion is caused by stray electrical currents, which are created by electrochemical reactions and the grounding of electrical systems. A cathodic protection system introduces a direct current into the corrosion cycle to offset and cancel out the corrosion-producing action.

Cathodic protection systems use an auxiliary anode of expendable metal which is immersed in the water. Electrical current flowing from the anode to the structure can counteract corrosion losses. Cathodic protection systems require at least annual scheduled maintenance by qualified technical personnel to check the condition of the sacrificial anodes and the wiring connections.

2. Concrete Tanks

Concrete tanks can be treated with a waterproofing system which will seal the surface cracks and stop any leakage and extend the life of the structure. Any coating system that is used must be approved by EPD. It is required that all products that come into contact with the drinking water must be certified as meeting the NSF Standard 61.

3. Ground Reservoirs

Ground reservoirs should be lined and covered to prevent leakage and contamination. The most common material for this purpose is a rubberized fabric. The structure should be checked for any deterioration, growth of weeds in cracks, etc., and the fabric cover should be checked for damage. These should be checked in the spring of the year since the winter ice can damage the fabric. The rain water, leaves, and debris should be removed periodically from the surface.

C. Safety Protection

Access to water system storage facilities can be a safety hazard. Proper precautions must be taken to protect the public and the employees from injury.

- 1. Where open storage reservoirs exist, there is the danger of someone falling into the water and drowning. All facilities such as this should be securely fenced to prevent unauthorized entrance. All employees working around these facilities should use life vests or other flotation devices.
- 2. All ladders on steel storage tanks should terminate at a safe distance above ground, be caged, and have a locked gate to prevent access by unauthorized personnel. All ladders should be caged for their full height or a safety harness should be provided.
- 3. No entrance to a tank should be made by any personnel without first checking for dangerous vapors, fumes, or gases. Also, do not enter a tank without a safety harness and rope tended by a fellow employee from the outside of the tank.
- 4. Fences around all storage facilities are recommended to prevent unauthorized access and possible vandalism.
- D. Records

A record should be kept of the following:

- 1. The location, year built and by whom, elevation at the base of the tank and the top of the overflow pipe, the size of the diameter and the height, and the capacity in gallons;
- 2. Painting records of the interior and exterior showing the year painted, type of paint, and the square area for painting. This information will be useful when setting painting budgets;
- 3. Altitude Valve Records The type and size of the altitude valve should be noted, along with the type and number of the leathers needed to make repairs, the date repairs were made, and any parts that were used.

3.4 Unaccounted-for Water

Unaccounted-for water is water which is produced but is not used or sold to the consumers. There are many factors which are considered in the determination of the percentage of unaccounted-for water. This percentage is a measure of the efficiency of the system operation.

A. Factors to Consider

Factors to consider in the determination of the unaccounted-for water are:

- 1. The water produced Is this quantity accurately determined, has the meter been calibrated, does the meter measure all of the water?
- 2. The water used for water system purposes such as chemical feed water, filter backwash water, fire hydrant and blow-off flushing How is each of these uses measured? Careful accounting in the treatment plant is necessary because, in some plants, plant use water is used before the master meter and, in other plants or for other uses, it is used after the master meter.
- 3. The water sold or used by the consumer must be accurately accounted for. A meter testing program should be in place to periodically test the accuracy of the meters. All consumer use must be accounted for. For example, free water may be provided for parks, cemeteries, or municipal purposes at sewage treatment plants, borough buildings, and fire companies. All of this water must be measured and accounted for.
- 4. Water used for fire fighting purposes This water only can be estimated, but some careful calculations by the fire company and the water system can develop a reasonable value.

B. Basic Calculation

The basic calculation is:

- 1. The water available for sale is the water produced adjusted for the company uses of water as follows:
 - a. Subtract any plant use water that is taken off the system after the master meter;

- b. Subtract any water used on the distribution system for flushing fire hydrants and blowoffs, and for fire protection.
- 2. The water sold or used is the total quantity of water sold to customers through meters plus an estimate of all unmetered uses either to flat rate customers or for public purposes.
- 3. When making the calculation, the time interval must be considered since the amount of water sold only may be determined monthly, quarterly, or annually, and usually all meters are not read on the same day or at the same time. It is recommended that a one year (four quarters or 12 months) period be considered since this will level off the variables for meter reading, and seasonal variations. This calculation can be made on a monthly basis by using the totals for the previous 12 months,
- C. Normal Operating Ranges

The normal operating range should not exceed 10 percent for a well maintained system. However, keep in mind that there are many factors that influence the percent of unaccounted-for water in a particular system. A number of these factors are:

- 1. The age and condition of the system. A very old water system which has deteriorated pipe will have many undetected leaks at joints and pinholes. Although the goal may be the 10 percent, it can only be accomplished by replacing large segments of the system. A range of 35 to 40 percent may not be unusual until funds for replacement of mains is available;
- 2. The pressure in the system can affect the rate of leakage. Thus, high pressure systems may have a higher percentage of unaccounted-for water;
- 3. The number of customers per mile of main can affect the unaccounted-for water. Therefore, if a system has a high ratio of miles of pipeline to the number of customers, the percentage of unaccounted-for water will increase;
- 4. Under-registration of customer meters or unauthorized use can increase the percentage of unaccounted-for water.
- D. Control of Unaccounted-for Water

To reduce the percentage of unaccounted-for water, the following are suggested actions:

- 1. Calculate the cost of producing a thousand gallons or one hundred cubic feet of water and then calculate the amount of money which is being " lost" as unaccounted-for water each month. By identifying this cost, you can justify the cost of the programs to correct the problem;
- 2. A meter testing program should be installed to test the master meter and other system meters at least annually and to test all customer meters (on a continuing basis) at least every 20 years;
- 3. An adequate leakage control program:
 - a. A program of listening to all fire hydrant valves and services to detect leaks,

- b. The use of detector type meters on fire lines,
- c. Training of meter readers and service personnel to listen for leaks and to detect unauthorized use of water,
- d. Review of meter readings to detect stopped meters or obvious under-registering meters;
- 4. A record of leaks repaired and the estimated amount of water lost at each leak can help to justify replacement of sections of mains which have a high incidence of leakage.

3.5 Maintenance of Water Mains and Services

The maintenance of water mains and services, in addition to the routine preventive maintenance of valves and fire hydrants, involves the repair of leaks and the thawing of frozen water mains and services. A description of the normal procedures should be included in the O & M Plan. The description should include a list of the staff, equipment, and materials normally available for this work, and where you can obtain help such as contractors and suppliers. You also should detail the notifications which are required such as utility locations and sensitive customers (i.e., hospitals, nursing homes, industries, fire companies, and police). You also should consider public notification through the news media for shutdowns of large areas or door-to-door notification for smaller areas.

A. Customer Complaints

Customer complaints are the normal indication that there is a problem in the distribution system. A record of customer complaints can help the water system identify and locate the problem. As an example, there may be a water system leak which will not surface. A number of low pressure and dirty water complaints in an area can indicate the area where a leak survey should begin. Another use for records of customer complaints is the justification for replacement of facilities. For example, a large number of complaints of dirty water on a dead end main may be justification to loop the main into another part of the system.

B. Water Main Repairs

The repair of water mains and services can be a very complex operation depending upon the conditions found in the field.

- 1. The location of water main and service leaks can be a major task since many times the water is flowing into underground passages or into sewers and does not surface. Locating the leaks involves a leak survey using sensitive listening equipment. Sometimes the drilling of holes in the pavement over the line of the water main will reveal the location. In some cases, exploratory excavation is necessary to find the exact location of the leak.
- 2. Once the leak is exposed, the water should be shut down so a detailed examination of the pipe, fittings, or services can be made to determine the extent of the damage. Frequently, the force of the leaking water causes additional damage to adjacent facilities. Because of the water leak, the earth in the trench frequently is saturated with water and unstable. The workmen should exercise extreme caution and install shoring and bracing as necessary since frequent cave-ins occur.

- 3. Once the extent of the damage is determined, a method of repair must be selected. This may involve a simple repair clamp or may involve the replacement of lengths of pipe, fittings, and valves.
- 4. The system operator must consider the area to be affected by the shutdown; the personnel, equipment, and materials required; and the amount of time necessary to complete the repair. Sometimes a temporary repair will permit proper planning and gathering of equipment and materials to effect a proper permanent repair with the minimum amount of customer inconvenience.
- 5. During the repair of the water main, the existing main and the repair materials can become contaminated. Before returning the facilities to service, the facilities must be disinfected, as required by the Rules for Safe Drinking Water, Chapter 391-3-5, and in accordance with the procedures established by the EPD's Minimum Standards for Public Water Systems.
- 6. After the repair of the water main, proper support and thrust blocking of the facilities must be provided. Any bends, tees, or end caps must have a thrust block to prevent movement due to water pressure. Because the surrounding earth usually is saturated with water and unstable, it should be removed and replaced with crushed stone or other suitable material. Care should be taken to tamp the crushed stone under the pipe to provide a good solid support. Heavy fittings and valves should be supported on concrete blocks to prevent settlement. The proper backfill of the trench including tamping will minimize the future maintenance of the excavated area.
- 7. The backfill material and the surface restoration may be specified by the municipality or the Georgia DOT. A street or highway excavation permit may be required prior to any construction.
- 8. Upon completion of all repairs and restoration, a record should be made to document what was done. This record can establish the cost of repairs and provide justification for replacement of old and deteriorated facilities. This record can establish the prompt repair and proper notifications of the shutdown.
- C. Thawing of Frozen Mains and Services

When water mains and services freeze because they are installed at too shallow a depth or because some of the original cover was removed after initial installation, they must be thawed to restore service. Frequently the freezing exerts sufficient internal pressure to break the pipe and after thawing, the main or service must be repaired.

- 1. The electrical thawing of frozen mains and services can be performed by special generators or welders; however, there is a danger of damage to customers' homes and electrical appliances and the possibility of causing a fire. For these reasons, the procedures for connecting the wires and disconnecting the customer's meter and any electrical connections must be detailed to limit the possibility of damage and liability for the water system.
- 2. Water mains and services can be thawed by use of steam generating equipment; however, this requires excavation or access to the facilities. These procedures also should be detailed to prevent injury.

CHAPTER 4 - LABORATORY EQUIPMENT MAINTENANCE

In a water treatment plant laboratory, fragile laboratory equipment and delicate instruments are used to detect and precisely measure very small concentrations of contaminants. Therefore, the proper maintenance and operation of the laboratory equipment and instruments is critical. The proper maintenance techniques vary between pieces of equipment which perform the same analyses but are supplied by different manufacturers. As a result, it is important to keep copies of the manufacturers' routine maintenance recommendations and operating manuals for the laboratory equipment in the O & M Plan and to follow these guidelines closely.

This chapter will outline some general maintenance and calibration procedures for the more widely-used pieces of laboratory equipment and instruments; however, the manufacturers' recommendations should always be referred to first. Recommended laboratory safety equipment will also be discussed. The routine maintenance plan for the water system (as discussed in Section I - Chapter 3) should include a routine maintenance schedule for the laboratory equipment. The following information may be incorporated into the maintenance schedule.

4.0 Glassware

A- Maintenance

The following procedures should be used in the care and maintenance of lab glassware:

- 1. Glassware should be examined with each use. Items with chipped edges or etched inner surfaces should be discarded. Chipped edges can cut hands, while scratches in the glass decrease visibility through it, possibly resulting in inaccurate analyses.
- 2. Glassware should be cleaned as soon as possible after use to ensure an adequate supply of clean labware and to promote cleaner labware by avoiding the formation of stains. Do not allow dissolved matter to dry on labware because future tests may be contaminated if glassware is not cleaned promptly after use.
- 3. Good labware cleaning procedure involves two washes and two rinses:
 - a. Detergent wash Any good household detergent is adequate for cleaning most laboratory glassware. Special detergents also are available from laboratory supply outlets.
 - b. Acid wash with 10 percent HCI.
 - c. Hot tap water rinse.
 - d. Distilled water rinse.

Inspect all glassware after cleaning; if water beads excessively on cleaned surfaces, rewash.

4. If stubborn stains or crusty chemical residues remain after normal cleaning procedures, glassware first should be washed with a cleaning acid, such as chromic acid (except for

glassware to be used for chromium or manganese analyses). Glassware items with especially stubborn dirt films may be cleaned by soaking in chromic acid or organic acid detergents overnight. A typical method uses a 10 percent solution of organic acid detergent. Plastic bottles, plastic stoppers, and hard-rubber items can be destroyed by washing them in chromic acid. Concentrated hydrochloric acid (HCI) should be used instead.

The technique for making chromic acid for cleaning is as follows:

- a. Slowly add one liter of concentrated sulfuric acid (H₂SO₄) to 35 ml of saturated dichromate solution, while stirring;
- b. Saturated dichromate solution is prepared by adding sodium dichromate to distilled water until a residue forms on the bottom of the flask and will not dissolve. Dichromic acid solution can be purchased already made. This would prevent minor laboratory accidents. The chromic acid will lose its cleaning power as moisture is absorbed from the air or from wet chemicals and will eventually turn green, at which point it should be discarded. Plastics and rubber should be cleaned by a strong solution of HCI.

4.1 Laboratory Support Equipment

- A. Hot Plate
 - 1. The heating surface should be cleaned after each use to avoid a buildup of stains and residue;
 - 2. Perform routine maintenance as recommended by the manufacturer.
- B. Magnetic Stirrer
 - 1. After every use, the surface of the stirrer should be wiped clean. The stirring bar also should be thoroughly cleaned before and after use;
 - 2. Routine maintenance should be performed according to the manufacturer's instructions.

4.2 Analytical Balance

Some of the precautions to be observed in maintaining and prolonging the dependable life of an analytical balance are as follows:

- A. The balance should be mounted on a heavy, shockproof table, preferably one with an adequate working surface and a suitable drawer for storage of balance accessories. Balance level should be checked frequently and adjusted when necessary;
- B. Balances should be located away from laboratory traffic and protected from sudden drafts and humidity changes;

- C. Balance temperatures should be equilibrated with room temperature, especially if building heat is shut off or reduced during nonworking hours;
- D. When not in use, the beam should be raised from the knife edge, the weights returned to the beam, objects such as weighing dish removed from the pan, and the slide door closed;
- E. Special precautions should be taken to avoid spillage of corrosive chemicals on the pan or inside the balance case and the interior of the balance housing should be kept scrupulously clean;
- F. Balances should be checked and adjusted periodically by a service man or balance consultant. If service is not available locally, follow the manufacturer's instructions as closely as possible;
- G. Operate the balance according to the manufacturer's instructions at all times;
- H. The balance should be wiped with a soft brush before and after each use. Balance pans should be cleaned after each use and spills should be wiped up immediately;
- I. Weights should be checked against certified weights monthly to assure balance accuracy.

4.3 Jar Test Apparatus

Because even the smallest detail can influence the result of a jar test and all samples in a series of tests should be handled as nearly alike as possible, proper maintenance of equipment is necessary to assure good operation.

A. Stirring Machine

The stirring machine has three to six paddles, each capable of operating at variable speeds from 0 to 100 rpm. Maintenance of the stirring equipment should be performed on a regular basis as recommended by the manufacturer. The stirring machine should be kept clean and lubricated (according to manufacturer's instructions) so that smooth revolution of the paddles at the specified speed may be assured. Also, the rotation speeds should be checked periodically to ensure that all paddles are rotating at uniform speeds.

B. Floc Illuminator

Located at the base of the stirrer, the floc illuminator enables observation of small floc particles. Care should be taken to keep the glass clean. The lamp should be checked routinely and replaced when needed. A replacement lamp should be kept on hand for this purpose.

C. Beakers

The six 1,500 ml beakers should be washed and rinsed after each test. Prior to starting a test, the beakers should be rinsed with tap water and turned upside-down for a few minutes to drain.

4.4 pH Meter

The pH meter consists of a sensitive voltmeter, a glass electrode, a reference electrode (made of either calomel or a silver/silver-chloride (Ag/AgCl) compound), and a temperature compensating device. In some units, the two electrodes are mounted in a single unit called a combined electrode. When the electrodes are immersed in the test solution, a circuit is completed through the voltmeter. The meter then converts the voltage change caused by the change in pH to a meter reading expressed in pH units. The temperature compensating device is needed because the pH of a sample is affected by temperature.

A. Maintenance

Some precautions to be taken in the care and maintenance of the pH meter are:

- 1. Glass electrodes should not be allowed to become dry during periods of inactivity. Follow the manufacturer's instructions for the storage of electrodes, since recommended solutions for short-term storage of electrodes vary with the type of electrode and the manufacturer. Generally, tap water is a better substitute than distilled water, but pH 4 buffer is best for the single glass electrode. Saturated KCI (potassium chloride) solution is preferred for calomel and Ag/AgCl reference electrodes;
- 2. Keep the pH electrodes free of oil, grease, or precipitates. These materials coat the pH electrode and may interfere with pH readings by causing a sluggish response;
- 3. Electrode troubles generally can be traced to a clogged junction which can be cleared by applying suction to the tip or by boiling the tip in distilled water until the electrolyte flows freely when suction is applied to the tip or pressure is applied to the fill hole.
- 4. The electrode may have a crystal buildup and should be flushed with distilled water and refilled with proper solution.
- 5. Routine maintenance should be performed in accordance with the manufacturer's instructions.
- B. Calibration

Proper calibration (standardization) is essential for accurate pH measurements. The purpose of standardization is to adjust the response of the glass electrode to the instrument. When only occasional pH measurements are made, the instrument should be standardized before each measurement. When frequent measurements are made and the instrument is stable, standardize less frequently. If sample pH values vary widely, standardize for each sample with a buffer having a pH within 1 to 2 pH units of the

sample. Calibrate the electrode system against standard buffer solutions of known pH. Because buffer solutions may deteriorate as a result of mold growth or contamination, prepare fresh solutions as needed for accurate work.

When calibrating the pH meter, the following method should be used:

- 1. Before use, remove electrodes from the storage solution, rinse with distilled water, and blot dry;
- 2. Place the electrodes in the initial buffer solution with a known pH, set the meter scale or needle to the pH of the buffer, and adjust for temperature;
- 3. Select a second buffer within 2 pH units of the sample pH and bring sample and buffer to the same temperature;
- 4. Remove the electrodes from the first buffer, rinse thoroughly with distilled water, blot dry, and immerse in the second buffer;
- 5. Record the temperature of measurement and adjust the temperature dial on the meter so that the meter indicates the pH value of the buffer at the test temperature;
- 6. Remove the electrodes from the second buffer, rinse thoroughly with distilled water, blot dry and immerse in a third buffer below pH 10, approximately 3 pH units different from the second;
- 7. The reading should be within 0.1 pH unit for the pH of the third buffer. If it is not, then look for trouble with the electrodes or potentiometer. Failure to obtain a correct value for the pH of the third reference buffer solution could indicate a cracked glass electrode, failure to maintain the KCI in the calomel electrode, or oily substances or precipitate coating the surface.

4.5 Specific Ion Meter

The unit consists of a millivolt meter and interchangeable electrodes. Each electrode is selectively sensitive to one particular constituent of the water and each specific ion test requires a different electrode. A pH meter with an expanded millivolt scale also can be used with the specific ion electrode.

- A. Maintenance
 - 1. Routine maintenance should be performed according to the manufacturer's recommendations;
 - 2. When a selective ion probe appears to be malfunctioning, the trouble generally can be traced to a clogged junction which can be cleared by applying suction to the tip or by boiling the tip in distilled water until the electrolyte flows freely when suction is applied to the tip or pressure is applied to the fill hole;

- 3. The electrodes should not be allowed to become dry during periods of nonuse and should be stored according to the manufacturer's instructions.
- 4. The manufacturer's instructions should be followed for refilling the probe assembly with the appropriate solution.
- B. Calibration
 - 1. When using the selective ion meter (or expanded scale pH meter), frequently recalibrate the electrode by checking the potential reading of the standard and adjust the calibration control.
 - 2. Always use manufacturer's instructions to calibrate the instrument.
 - 3. Commercial standards, often already diluted with buffer, are frequently supplied with the meter. The shelf-life of each standard which should be provided by the manufacturer should be checked and the solution discarded when the shelf-life has been exceeded. The stated concentrations of these standards should be verified by comparing them with standards prepared by the analyst for each ion to be analyzed.
 - 4. Recalibrate the meter after reading each unknown and also after reading each standard when preparing the standard curve.

4.6 Turbidimeter

The turbidimeter measures the clarity of water by measuring the amount of light scattered by the suspended particles in the sample of water. It consists of a light source, focusing device, sample compartment, detector (phototube), and meter. The light passes through the focusing device, enters the sample compartment, and passes through the sample. The individual particles in the sample that cause turbidity reflect the light on to the detector (phototube) which measures the amount of light reaching it. The meter then indicates the corresponding turbidity.

A. Maintenance

For production of data with maximum accuracy and precision, the following procedures should be observed:

- 1. It is important to locate the turbidimeter on a sturdy bench which is on solid footing, since vibration can cause high turbidity readings;
- 2. Keep sample tubes clean, both inside and out, and discard them when they become scratched or etched. Special wiping tissues which will not scratch glass should be used to clean the sample tubes;
- 3. Sample tubes should not be handled where light strikes them. Use tubes with a protective case so that they may be handled properly;

- 4. Fill tubes with samples that have been mixed well and allow sufficient time before testing for bubbles to escape;
- 5. Schedule at least one maintenance contract service call every six months for maintenance, repair, and calibration;
- 6. Have a supply of replacement lamps on hand.
- B. Calibration
 - 1. Follow the manufacturer's operating instructions. In the absence of a precalibrated scale, prepare calibration curves for each range of the instrument;
 - 2. The meter can be calibrated using a prepared standard turbidity suspension. The standard turbidity suspension and dilute standards should be prepared weekly by dilution of the stock turbidity suspension. The stock turbidity suspension should be prepared each month.
 - a. Stock Turbidity Suspension
 - 1) Solution 1 Dissolve 1 gram hydrazine sulfate, (NH₂)₂-H₂SO₄, in distilled water and dilute to 100 ml in a volumetric flask.
 - 2) Solution 2 Dissolve 10 grams hexamethylene tetramine in distilled water and dilute to100 ml in a volumetric flask.
 - 3) Prepare stock solution by mixing 5 ml of Solution 1 and 5 ml of Solution 2 in a 100 ml flask. Allow to stand for 24 hours at 25 $\pm 3^{0}$ C, then dilute to the 100 ml mark and mix.

This stock solution, which has a turbidity of 400 turbidity units, should be used to prepare the standard turbidity suspension.

- b. Standard Turbidity Suspension Dilute 10 ml of the prepared stock turbidity suspension to 100 ml with turbidity free water. The turbidity of this solution is defined as 40 turbidity units. Dilute portions of the standard turbidity suspension with turbidity-free water as required to obtain standards of desired turbidities. For example, diluting 10 ml of the 40-unit suspension to 100 ml would produce a four unit suspension standard. The four-unit standard only is accurate during the day of preparation.
 - 1) Measure standard solutions on the turbidimeter covering the range of interest. If the instrument already is calibrated in standard turbidity units, this procedure will check the accuracy of the calibration scales;
 - 2) At least one standard should be run on each instrument range to be used;

- 3) Insert a tube containing a standard suspension of known turbidity;
- 4) Adjust the turbidimeter needle until it registers the known value;
- 5) Remove the standard, insert the sample, and read the turbidity value directly from the instrument.

4.7 Spectrophotometer

The spectrophotometer is an electronic device which measures the concentration of a constituent by measuring the intensity of a color. The unit's main components are a white light source, wavelength control unit, sample compartment, detector, and meter. The white light passes through a diffraction grating or prism to produce single-color light (light of a specific wavelength) which, in turn, passes through the sample contained in a glass tube (cuvette) located in the sample compartment. The ratio of the light emerging from the liquid divided by the light entering the liquid is the percent transmittance (% +). This is sensed by the detector and indicated on the meter. The concentration of a measured constituent is found using a previously prepared calibration curve which must be prepared for each constituent to be measured.

A. Maintenance

Some precautions to be taken in the care and maintenance of the spectrophotometer are:

- 1. Routine maintenance should be done according to the manufacturer's recommendations and, as a minimum, should consist of keeping the unit clean and replacing the lamp when needed. A supply of replacement lamps should be kept on hand;
- 2. The instrument must be protected from high humidities and water vapor to avoid deterioration of the optical system;
- 3. The absorption cells (cuvettes) should be kept very clean, free of scratches' fingerprints, smudges, and evaporated film residues. Matched cells should be checked to verify that they are equivalent by placing portions of the same solution in both cells and taking several readings of the percent transmittance (% T). Clean cells with acetone and a soft Q-tip. Mismatched cells should be discarded.
- 4. Repair of the instrument requires special skills and, therefore, should be performed by a specially-trained service person.
- B. Calibration

Check sensitivity and accuracy frequently by testing standard solutions to detect electrical, mechanical, or optical problems in the instrument and its accessories. Some recommendations are as follows:

- 1. The preparation of a complete set of standards for each set of samples to be analyzed is unnecessary; however, with every group of samples a reagent blank (made by adding reagent to distilled water) and at least one standard in the upper end of the optimum concentration range should be prepared to verify the constancy of the calibration curve. This precaution will reveal any unsuspected changes in the instrument, the reagents, or the technique;
- 2. At regular intervals (refer to the manufacturer's recommendations), a complete set of standards -- at least five or six spaced to cover the optimum concentration range -should be prepared to check the calibration curve;
- 3. The calibration curves supplied by the manufacturer should be used with care, as should the commercial permanent standards of colored liquids or gases. Permanent calibration curves or artificial standards which have been prepared accurately by the manufacturer may not always be valid under conditions of use. Furthermore, permanent standards may be subject to fading or color alterations and their validity may depend on certain arbitrary lighting conditions. Therefore, frequently verify the accuracy of these curves or permanent standards by comparing them with standards prepared in the lab using the same set of reagents, the same instrument, and the same procedures as those used for analyzing samples.

4.8 Safety Equipment for the Laboratory

A. Fire Extinguishers - Fire extinguishers may prevent a large laboratory fire if used quickly on a small fire. All laboratories should have at least one all-purpose fire extinguisher that is capable of putting out small fires. All extinguishers should be checked routinely.

There are four general types of fire extinguishers. Depending on potential hazards, a laboratory may have more than one type:

- 1. Water-type Extinguisher Useful for fires with ordinary combustibles like wood, paper, and rags;
- 2. Dry Chemical-Type Effective against most fires, but particularly those involving flammable liquids and metals, as well as electrical fires;
- 3. Carbon Dioxide-Type Useful for small fires involving flammable liquids and for limited use around electronic instrumentation and equipment;
- 4. Halon Extinguisher Good for fires involving electronic equipment because it leaves no residue and does not affect delicate instruments.
- B. Fire Blanket Its major purpose is to extinguish burning clothing, but it can be used to smother liquid fires in small, open containers. The blanket should be stored in a container mounted on a wall in the lab and arranged in the container so that it can be pulled out easily.
- C. Safety Showers Safety showers are an integral part of laboratory safety to be used in accidents involving acids, caustic or other harmful liquids, clothing fires, and other emergencies. The shower should be located in a convenient, easy-to-reach location in

the lab, and the floor space under it should be kept uncluttered. It should be provided with a floor drain and a large, easy-to-grab pull chain ring. The shower, which should be designed so that once it is turned on it stays on until turned off by a separate valve, should be tested regularly.

- D. Eye Wash Eye washes can be bottles with an eye cup or spray nozzle and one liter reservoir used to flood the eye, or they can be permanent plumbing fixtures similar to a drinking fountain. Eye washes should be located at sinks for ease of location in the event of an emergency.
- E. Personal Protective Equipment and Materials The selection and use of this equipment is governed by the particular tasks to be performed. If it is determined that such are needed, it is the responsibility of the manager and the supervisor to ensure that they are used.
 - 1. Clothing Personal clothing creates a barrier between the worker and the hazard. Employees using radioactive materials, suspected carcinogens, and pathogenic materials should change from street to laboratory clothing when entering the work area and should change again when leaving. This not only prevents the transportation of hazardous materials outside the area, but it also permits necessary handling and cleaning of the clothing. A laboratory coat and rubber apron should be available to the employees.
 - 2. Gloves Appropriate gloves should be worn. The type of glove depends on the materials to be handled (i.e., rubber gloves should be worn when handling hazardous liquids, surgical gloves for pathogenic material, insulated gloves for handling hot or extremely cold objects, and white cotton gloves to protect instruments).
 - 3. Safety Shoes Often safety shoes are required in labs where heavy objects or equipment are to be moved. No open-toed shoes or sandals should be worn in the laboratory.
 - 4. Safety Glasses Safety glasses are worn to protect eyes from splashes, flying objects, powders, or ultraviolet exposure. For certain activities, such as working with acid or caustic materials, a face shield should be worn to protect the face as well as the eyes.

SECTION III - OPERATION and MAINTENANCE FOR SMALL GROUNDWATER SYSTEMS

INTRODUCTION

How to Use Small System O & M

The purpose of Operations and Maintenance for Small Groundwater Systems is to provide assistance to the small groundwater supplier in the preparation and development of an Operation and Maintenance (O & M) Plan and the operation and maintenance procedures for their system.

Operations and Maintenance for Small Groundwater Systems is provided for use by small systems which have a water well(s), disinfection, some additional chemical feed (i.e., polyphosphate material), a distribution system, and some system storage. Systems which have more extensive facilities can use those parts which are applicable in Sections I and II of this guidance manual for additional detailed information.

Why Is An O & M Plan Necessary?

An O & M Plan should be developed by every public water supplier to provide a written source of material which can be easily referred to for guidance in operating a water system. An O & M Plan will be a valuable reference tool for operating personnel, because standard operating procedures for the system and guidelines for start-up and emergency situations will be at their fingertips. The O & M Plan also will provide a ready reference for all equipment data which is necessary for performing normal maintenance and for ordering replacement parts and supplies. The O & M Plan will contain an organized system for keeping all records of system operation. The O & M Plan will have a detailed plan for water sampling and testing which is required for compliance with the Safe Drinking Water Act.

How to Develop an Effective O & M Plan

The operator should be able to prepare or be intimately involved in the preparation of the O & M Plan. If the O & M Plan is to be prepared by engineers and managers, they must be certain that they obtain information from persons actually experienced in plant operation and maintenance.

The procedures should be described in terms and language which are readily accepted and understood by the operators. Because of the technical nature of the water treatment process, a basic level of knowledge and understanding by the operators must be assumed. The entry level operator frequently will refer to the O & M Plan for guidance and instruction, and the experienced operator should refer to the O & M Plan for guidance during unusual conditions.

Some water suppliers may have O & M Plans or certain parts of O & M Plans established for their system. These may include Emergency Response Plans, Safety Programs, Water Conservation Programs, Cross-Connection Control Programs, or other procedures. Existing plans and programs can be directly included in your O & M Plan without rewriting. Your O & M Plan can be a collection of plans and programs which will probably be stored in loose-leaf notebooks. Its appearance is not as important as the availability of the information to the operating personnel and the ability to revise and update it to reflect changes.

PART A - GUIDANCE

A.1 Description of Facilities

1.0 Owner

The owner should be identified at the beginning of the O & M Plan. Either an organization chart or a simple list of the "chain-of-command" showing the lines of authority should be included. This list should show name, address, telephone number, and title of each person.

1.1 Service Area

The service area of the water system should be described briefly and should be shown on the distribution map. The location of the map should be indicated in the 0 & M Plan-

1.2 Permits

All permits which arc applicable to the operation of the water system should be listed with a description of their purpose. A copy of these permits should be included with the O & M Plan, or a reference to where they are filed should be made.

1.3 Source

The source of supply for a small system may be a well, a spring, or water purchased from another water supplier. The information needed to fill out the forms should be available in your files or from the well driller. If the information is not available, request help from the EPD office. They may have information in their permit files. If you have purchased water, the supplier should be able to furnish the information you need. If you have a spring, the information may be harder to obtain; you will have to rely on the recollections of yourself and others. The location of all sources should be shown on a map. A brief description of the source or sources of supply should be attached to the O & M Plan.

1.4 Treatment

Disinfection such as chlorination (e.g., chlorine, calcium or sodium hypochlorite) may be the only treatment provided for a small system. Any additional treatment provided also should be described and listed in the same order as the flow through the system. A brief description of the treatment should be attached to the O & M Plan.

1.5 Distribution

The distribution system for a small system usually is very simple and does not contain pressure zones or booster pumps. A brief description of the system pumping and distribution system operation should be attached to the O & M Plan.

1.6 Finished Water Storage

The distribution storage for a small system is usually a hydropneumatic pressure tank(s), a cluster of bladder tanks, a standpipe or an elevated tank. Some small systems may have concrete ground level reservoirs. The ground level reservoirs must be covered to prevent possible contamination. A brief description of the finished water storage should be attached to the O & M Plan.

1.7 Flow Chart

A simple flow chart of your sources of supply, pumps, treatment, distribution system, and storage should be prepared. A flow chart does not have to be drawn to scale and can be very simple.

A.2 Start-up and Normal Operating Procedures

This portion of the O & M Plan discusses the normal operation of each treatment process and provides guidance for alternate and emergency operations. The information provided in this section should address valve positions, capacities of each process, pump adjustments, and process control variables. Schematics and drawings should be used as part of these discussions.

2.0 Controls

The key to proper operation is understanding how to control the equipment variables as well as the process variables. Describe methods of controlling each component of the process including any limitations to process operation. For example:

- A. Flow Rates Describe control for each source or pump.
 - 1. Pressure
 - 2. Tank level
 - 3. Low water level cut-off
- B. Chemical Dosages Describe control for each chemical.
 - 1. Safe Drinking Water Requirement What level is required? For example, what level of disinfection is required at the source, and what level of disinfectant is to be maintained in the distribution system?
 - 2. Engineer or chemical supplier recommendation When, what levels, for what purposes?
 - 3. What control tests are necessary?
- C. Tank or Reservoir Levels Describe control limits high and low. 1. Altitude or control valves
 - 2. Pump controls On/off
- 2.1 Start-up

On start-up of any piece of equipment, certain procedures must be followed to assure that the equipment will not be damaged, that other pieces of equipment are interlocked so they start or stop in tandem with another facility, and that the water produced is of acceptable quality. The O & M Plan should have a checklist for each piece of equipment showing step-by-step the items that should be checked at and during start-up.

2.2 Normal Operating Conditions

- A. A description of the water quantity and quality including any anticipated variations should be provided for each part of the treatment process. The description should include maximum and minimum conditions.
- B. A pressure survey of the distribution system must be conducted annually. The information should be recorded in the O & M Plan.
- 2.3 Alternate Operating Procedures

The O & M Plan should include a description of any alternate sources, the steps necessary to put them in operation, and any system changes which must be made when using an alternate source.

2.4 Emergency Operating Procedures

A list of potential emergency situations (i.e., power, well and water storage failure, pump failure, loss of supply, drought, chemical or disinfection system failure) should be prepared. This already should have been developed in your Emergency Response Plan. The Emergency Operating Procedures include specific operating details and instructions, and it extends beyond and complements the Emergency Response Plan. For example, the Emergency Response Plan discusses hookup and activation of the portable generator. The Emergency Operating Procedures will include specific instruction as to how to hook up the generator unit or emergency pump, including wiring information and tools needed for hookup. These instructions will include names of persons trained in the procedures, special equipment, tools, or fitting and their locations. The manager should have all hookup and operating procedures defined for the different emergency situations in such a manner that a person(s) would be able to operate the processes and equipment with only a basic familiarity with the system.

2.5 Common Operating Problems

A troubleshooting guide should be available to quickly identify problems, probable causes, and a brief description of possible control or prevention techniques. Samples of well pump not operating and loss of chlorine residual troubleshooting guides can be found below. These can be used to develop your own troubleshooting guides.

Operating Problem	Checking Sequence	Information-Operating Goals-Specification
Loss of Chlorine Residual	 Test free available chlorine residual in water leaving the pump 	 If free available chlorine residual is high enough to detect at least 0.2 mg/L level in the distribution system, the chlorine feed system is
	station	operating correctly.

Trouble Shooting Guide Loss of Chlorine Residual

	2. If there is no free available chlorine residual or if the concentration is lower than normal, this indicates a failure of the chlorine feed system.
2. Are chlorine solution feed pumps operational?	 If chlorine solution feed pumps are operating, go to checking sequence 3. If chlorine solution feed pumps are not operating: a. Check electrical supply; b. Check condition of pumps, including on/off switch; c. Have spare pump installed;
3. Check if chlorine gas or solution is available in adequate quantity.	 d. Have pump and/or motor repaired. 1. Chlorine solution tank should be filled. 2. Chlorine gas cylinders should be replaced if they are near empty. 3. If solution is available, go to checking sequence 4.
4. Check operation of chemical feeders and valves.	 If problem cannot be solved at this point, a spare unit should be installed or supply should be shut off and assistance should be sought. Notify EPD immediately.

Trouble Shooting Guide Well Pump Not Operating

Operating Problem	Checking Sequence	Information-Operating Goals-Specification
1.Well Pump	1. Check pressure and flow	1. If pressure and flow values are at the static level (zer
Not Operating	values.	flow and low pressure), the pump is off. If the values are more than zero and indicate an outward flow, and the pressure is low, the problem may be a large leak i <u>Note:</u> Beware of reverse flow (flow in from the system into the well) due to a failed check valve or foot valve.
	2. Check electrical breakers and/or fuses.	1. Check electrical breakers for tipping due to current or voltage surges. Check fuses. Reset breakers, replace fuses. If pump starts, continue

	checking for 10 to 15 minutes as it may trip off again.2. Beware of overheated electrical control circuits in months; forced ventilation may be needed.
3. Check controls for proper Operation.	
4. Check for closed valves or broken check valves.	1. Check operator valves. Are they opening?
4. If pump has not started, Seek assistance from an Electrician or well pump Maintenance contractor.	1. If pump is inoperable and needs extensive repairs, installation of a spare pump may be required.

A.3 Maintenance

The objective of a planned maintenance program is to prevent unplanned, reactive maintenance. To accomplish this, the operator must have knowledge of the equipment, its required maintenance, and the spare parts to be stocked. A record of the repairs made to each piece of equipment should be kept. This allows appropriate judgements to be made about the maintenance program, and the quality and condition of the equipment. All routine maintenance must be scheduled for frequency. All contracted maintenance services should be scheduled for frequency.

- Routine Procedures All routine procedures are grouped together on a checklist according to their scheduled frequency. The procedures normally are synchronized with the calendar year to go evenly into an annual cycle (i.e., weekly, monthly, quarterly, semi-annually, or annually). The procedures also can be initiated by an hourmeter.
- Manufacturer's Recommendations Every maintenance procedure should conform to the manufacturer's recommendations, experience, and environmental factors. For example, wet or dirty conditions would require more frequent maintenance.

3.0 Source

The O & M Plan should show the established maintenance procedures for the well, pump, chlorinator, and any other equipment associated with the source of supply. For example:

Well (monthly) - Check for any type of ground settlement or other signs that surface water could infiltrate the bore hole.

Well Pump (monthly) - Check water seals and packing glands. Also, check for vibration and excessive heat. Lubricate according to the manufacturer's recommendations at a regular frequency (weekly/monthly).

Chlorinator (weekly) - Clean strainers and vent lines, and check for leaks.

Chemical Feed Pump (weekly) - Check diaphram and poppet valves.

3.1 Distribution

A routine maintenance program for the distribution system would be valve operation and maintenance, such as checking packing glands for leakage, on an annual basis. Maintenance of fire hydrants usually is scheduled on a semi-annual basis and includes lubrication of the stem and threads on the caps, and exercising the valve.

3.2 Finished Water Storage

Maintenance procedures should be established for storage facilities and should include draining and cleaning at an established frequency (yearly) and for painting (done on a longer term basis). A concrete structure may require grouting and sealing of cracks (yearly) and, on a longer term basis, the application of a sealing material.

The altitude valve and control valves need to be examined and operated at an established

frequency. The grounds, buildings, and fences should be checked at an established frequency.

A.4 Records

The water system can use records as a guide in regulating, adjusting, and modifying the facilities and their operation. Another important function of record keeping is the establishment of a reliable continuing record of proof of performance for justifying decisions, expenditures, and recommendations. Should a dispute arise, records and reports, together with the operator's testimony, provide the water system with factual information with which a sound defense and adjustment may be established.

The O & M Plan should stress the importance of the reporting and records maintenance program and should outline the types of records and reports that will be maintained, as well as how these records to be kept.

Every water system must submit and maintain a variety of reports and records for regulatory agencies. In order to assure that the correct records are maintained for the required length of time, it is important to include in the O & M Plan a section which outlines what records and reports are required and how long each must be maintained.

The following are the type of records that should be maintained:

- Physical Plant and Equipment Include with the plan a list of all records (plans, specifications, manufacturer's manuals, etc.) which are to be maintained and note where they are to be filed and protected. The name and phone number of the engineer or other consultant should be included in the records because the engineer can help in answering questions about the system operation. The location of these plans should be noted in the O & M Plan so they can be easily located and used by the operator.
- Operation These are records to show the water quality, flow (million gallons per day), treatment adjustments, and schedules of hours each day that each measurement must be taken.
 - 1. Flow
 - 2. Chemical feed (name, quantity per day, mg/L)
 - 3. Inventory (treated water in storage)
 - 4. Sampling (self-monitoring samples)

- 5. Pumping (pumps used and hours of operation)
- 6. Physical/chemical water quality
 - a. Chlorine residuals
 - b. pH
 - c. Water temperature

Operating record sheets are forms which allow the records described above to be maintained in an organized, tabular form. A small groundwater system may need only one or two simple monthly operating record forms to maintain operating information for an entire month. Operating forms prepared by EPD must be used for compliance reporting to EPD each month.

- Preventive Maintenance Preventive maintenance records are needed to provide accurate documentation of maintenance work on repairs which have been done on water system equipment. These records are useful for budgets and when purchasing equipment.
- Operating Costs It is important to maintain accurate records of water system operating costs because these records may be used to help plan future operating budgets, justify water rate increases, evaluate water system expenditures, and compare costs from one year to the next.
- Emergency Conditions Documentation of emergency conditions, as well as the actions taken in response to the emergency, should be compiled for each significant emergency and filed into the water system records. As an example, an Emergency Conditions Report for flooding of the treatment plant should include the following:
 - 1. Time of notification of the impending flooding;
 - 2. Actual time flood water entered the treatment plant site;
 - 3. Measurement of highest water level in relation to the physical structures at the treatment plant;
 - 4. Location where water first entered the plant;
 - 5. Equipment and/or structures damaged by the flood. Was the equipment shut down. Record time and date;
 - 6. Reports of maximum flood stage of the receiving stream;
 - 7. Protective actions taken by plant personnel;
 - 8. Other organizations or agencies contacted and actions taken by them;
 - 9. Length of time and degree to which water quality was affected. Include documentation of all customer complaints noting date and time and the follow-up actions;
 - 10. Description of repairs and/or replacements required to restore plant to original condition. Record time, cost, and date of restoration of each unit;
 - 11. Contractor, repair service, or equipment vendor involved in repairs/replacements, together with the individual who represented the company;

12. Actions taken to prevent reoccurrence of emergency condition. Recommendations for revisions to Emergency Response Plan and capital improvements.

This information could be necessary if insurance claims arise as a result of a particular emergency condition.

• Notification - When public notification is required, it is important from a legal and management standpoint that records of the notification are kept, including dates of notification, procedures used to abate the condition, follow-up test results, and date notification advisory was lifted. Keep records of all correspondence, and all contacts with local and state agencies regarding the emergency situation.

To prevent the loss of records through flood, fire, or other disaster, a spare copy should be on file at a second location. The O & M Plan should specify where a copy of the records is located.

A.5 Sampling and Compliance Monitoring

One primary responsibility of the public water supply operator under the Safe Drinking Water Act (SDWA) is the routine sampling and testing of the treated water quality to assure that the water being served does not present a health risk to the consumer.

This part of the O & M Plan should outline the procedures for properly sampling and monitoring, including locating and collecting samples, as well as obtaining certified laboratory services.

5.0 Sampling and Analysis

Sampling is the first step in any water quality analysis program; therefore, it is important to develop a sampling program which provides accurate representation of the quality of the water being sampled. This can be accomplished by establishing sample dates, times, and locations so that they truly represent system conditions and by the implementation of a sound quality assurance program.

A. Scheduling - The O & M Plan should include a yearly sampling schedule which clearly outlines what samples should be collected and on what days to assure that the proper samples are collected and analyzed on time. The schedule also should identify sampling locations. This information can then be entered into a table prepared by the system.

The basic sampling schedule for each water supply will be determined largely by the routine monitoring requirements of the drinking water regulations. The operator should review these requirements, establish a sampling schedule to meet them, and enter the schedule into the table. The sampling schedule, once established, should be updated annually to accommodate schedule or sampling location changes.

Future amendments to the regulations will result in additional monitoring requirements. Therefore, it is important for the water supplier to keep in contact with EPD and be informed about the new requirements so the sampling schedule can be updated to reflect the changes.

The following factors should be considered when developing a sampling schedule:

- 1. Microbiological samples should not be scheduled to be collected all in one day. Rather, they should be spread out over the month so that the samples are representative of bacteriological conditions within the system during the entire month;
- 2. Chlorine residuals should be taken concurrently with the microbiological samples. Chlorine residuals will probably be taken more frequently in accordance with EPD's recommendations.
- 3. Coliform sample collection should not be scheduled for Fridays. The laboratories would not begin the coliform analysis until Monday, and by then, the sample would be too old;
- 4. Schedule sampling so that samples which must be analyzed immediately are not delayed in transit while other samples are being collected.

B. Location

Once the required type, number, and frequency of sampling has been determined, the specific location of sample points must be selected and incorporated into the O & M Plan. The main objective in sample point selection is to choose points which will provide samples that are truly representative of the type of water to be analyzed. This section outlines sample point selection guidelines and the distribution system sampling. It also discusses how the selected sample point locations may be made a meaningful part of the O & M Plan.

1. Raw Water Sampling

Groundwater (Wells) - Raw water samples may be collected from a sample tap installed on the well discharge line at a point prior to any chemical additions or treatment processes.

2. Distribution System Sampling

Although distribution system sample point selection is somewhat judgmental, as a minimum, the points selected must be representative of each different source entering the system and of conditions within the system. Also, sample points must be located according to the requirements of the SDWA.

a. Sample Location Selection

The largest number of samples collected from the distribution system will be used to test for coliform bacteria and chlorine residuals. The point selected for collection of these samples should be as representative of all sources as possible. Exact sampling points for disinfection by-products (DBPs), volatile organic compounds (VOCs), inorganics, and radionuclides should be acceptable to EPD. Generally, the sampling location for most tests will be the entry point to the distribution system and representative of each source. When selecting bacteriological sample point locations, the following factors should be considered:

- Sample points should be uniformly distributed throughout the system;
- Sample points should be located so that water flowing from storage tanks may be sampled, rather than water flowing into the tanks;
- For systems having more than one water source, sample points should be located in relative proportion to the number of people served by each source and should be representative of water from each source;
- The locations of sampling points should be changed annually so that a better representation of system conditions can be achieved.
- b. Sample Point Selection

Once representative sample points have been located in the distribution system, specific sample faucets must be selected. The following guidelines may be useful in the selection of sample faucets:

- The selected taps should be a cold water faucet closest to the point where the water main enters the house;
- Samples should not be taken from drinking fountains, swivel faucets, faucets with strainers, leaking faucets which permit water to run over the outside of the faucet, or houses with home water treatment units, including softeners. Faucets which are dirty or are in areas with excessive dust, smoke, or other sources of contamination should be avoided.

Once each representative sample point has been selected, it should be entered into the sampling schedule along with a description of the location and it should be assigned a sample point number. Each point should be plotted on a copy of the distribution system map. This map then should be included in the O & M Plan.

C. Quality Assurance

The result of any analysis or water parameter measurement is no better than the sample used. Guidelines for proper sample collection, handling, preservation, transportation, and storage techniques are essential to a monitoring program. It is important that these procedures be included in the O & M Plan so that water system personnel responsible for collecting and analyzing samples have a quick reference available to them .

D. Laboratory Services

The SDWA requires that all sample analyses to be used for determination of compliance with the monitoring requirements must be performed by a laboratory which has been certified by EPD.

The water suppliers may wish to retain the services of a certified private laboratory. The laboratory which performs the analyses must record the results on the standardized reporting forms which are then submitted to EPD and to the water supplier within 10 days of the end of a monitoring period. The laboratory also is responsible for contacting the water supplier whenever it receives

unacceptable samples or if an MCL has been exceeded, and is responsible for notifying the department in writing within 24 hours after an MCL is exceeded or check samples are required.

Water systems may have the option of contracting with the EPD Laboratory to perform the entire monitoring and reporting procedure, or to provide whatever combination of laboratory services the water supplier wishes.

It is, ultimately, the water supplier's responsibility to assure that the proper samples are collected and analyzed, and that the results are reported to the proper parties in a timely manner. Therefore, regardless of who performs the sampling, analyses and reporting procedures, the operator should establish the sampling and analysis schedule, forward a copy to the lab, and maintain a copy in the O & M Plan so that the entire sampling and analysis program may be monitored effectively. The name, address, and phone number of the responsible laboratory should be included in the O & M Plan as well as a detailed outline of the services which the outside laboratory is responsible for providing and the duties which are the responsibility of the water supply.

E. Sample Collectors

The persons designated to do the sampling have to be trained in proper sample collection, preservation, and recordkeeping techniques. Refresher training on proper sampling techniques should be provided periodically to assure that correct procedures are being used.

The sampling schedule should include the name(s) of the person(s) responsible for the collection of each sample, as well as that of a backup sampler in the event of illness, etc. This will assure that all samples are collected on schedule.

5.1 Compliance Monitoring

Once the samples have been properly collected and the analyses have been completed, the results of these analyses must be interpreted and decisions made based on these interpretations. Resampling may or may not be required, records must be maintained, and notifications to EPD and water system management may or may not be needed.

There should be one person responsible for overseeing and coordinating all aspects of the water quality monitoring program for the water system. The responsibilities of the program coordinator would include schedules, training, assignment of personnel, laboratory coordination, notification. keeping records. interpreting results, check samples, reporting to DEP and management, and review of program.

A. Interpretation of Results

Once the water quality analysis results have been received, they must be reviewed to determine what follow-up actions are needed. When the analysis of a sample shows that an MCL has been exceeded, check sampling is required to confirm the routine sample results and to provide a safeguard against sampling or lab error. The department also must be notified, as should the water system management personnel.

The interpretation of analysis results extends beyond determination of compliance with the regulations to the monitoring of the routine operation of the water system. It is a key

responsibility of the coordinator to see that all water analyses are reviewed and interpreted to identify any operation and maintenance modifications, changes in chemical feed points or rates, or additions or changes to the treatment processes that may be needed.

B. Notification

The water system personnel also are responsible for assuring that all necessary notifications, both to EPD and to water system management, are made within the required time periods.

- 1. The reporting to EPD, as they relate to the water quality program, are as follows:
 - a. Routine sample reporting

The results of any test required by the regulations must be reported within the first 10 days of the month following the end of the monitoring period, or within 10 days after they are received, whichever is sooner. This allows data for each month to be summarized and sent in at one time, instead of submitting each individual test result immediately after it is received. Even if it is a contract laboratory's responsibility to report the routine sample results; the water supplier should follow up on the samples to confirm that the results have been reported on time.

b. Check sample and violation reporting

Generally, any sample result which exceeds an MCL must be reported to EPD by the supplier within one hour, as must the results of check samples which confirm the presence of a contaminant. Furthermore, the supplier must report any failure to monitor to the department within 48 hours. In all cases, public notification also is required.

The O & M Plan should provide a handy reference to the EPD's reporting requirements, as well as of the procedures to be followed to meet them, and should include the name, address, and phone number of the EPD contact person, including an emergency phone number which will be answered 24 hours a day.

- 2. The management of the water system should be advised whenever circumstances require check sampling, EPD notification, or public notification. A water system policy on notification of management should be established and incorporated into the O & M Plan so that the proper action may be taken in any given situation. This policy should include:
 - a. A table or flow chart (or both) summarizing what situations require notification, who should be notified in each case, and when they should be notified (i.e., prior to or following EPD notification);
 - b. The phone numbers, both home and office, of each person to be contacted.
- C. Recordkeeping

A procedure for maintaining accurate sampling and reporting records should be established. All employees who are responsible for the sampling and reporting programs should be provided with training on proper records maintenance procedures.

1. Sample Records

The following are some suggested guidelines for procedures in keeping accurate sample records which, in turn may be included in the O & M Plan:

- a. Each sample bottle should be assigned a number which corresponds to a number on a recordkeeping form that is maintained as a permanent part of the water supply's records;
- b. Each sample bottle should be affixed with a label or tag which includes the following information:
 - Sample number,
 - Date sampled,
 - Time sampled,
 - Location sampled,
 - Type of sample (i.e., routine, check, special purpose, etc.),
 - Sample collector,
 - Chlorine residual (recommended whenever coliform tests are taken);
- c. The information on the label then should be entered on the sample record form;
- d. A copy of a sample label should be included in the O & M Plan, as should a copy of the sample record form and sample recordkeeping instructions.
- 2. Reporting Log

A reporting log should be developed and also should be maintained to keep a record of all incidents which required some type of notification. This log should be maintained as a permanent part of the water system's records. Also, copies of any written or published notification should be maintained in the permanent records as well. Some recommended items to be included on the reporting log are as follows:

- a. Date of notification;
- b. Type of notification (i.e., EPD, management, public, etc.);
- c. Time of notification;
- d. Person contacted;
- e. How notified (i.e., telephone, in writing, newspaper, etc.);
- f. Reason for notification (i.e., failure to monitor, MCL violation, treatment technique, etc.)

- What, specifically, was reported,
- Response of the person notified (i.e., specific directions, advice, or instructions);
- g. Follow-up action (if applicable);
- h. Comments.

A.6 Public Notification

One of the most important provisions of the Safe Drinking Water Act is the requirement that the water supplier notify its customers when the system is in violation of the regulations. Public notification is required to protect consumers from water that may be temporarily unsafe. If used properly, public notification also can increase public awareness of problems that the water system faces and the costs of supplying safe drinking water.

6.0 Content of Notification

Since specific details of an actual public notice will vary depending on the circumstances, it is difficult to have specific notices prepared ahead of time and ready for use when needed. Therefore, it is important to have available all the information needed to prepare a notice when the occasion arises and to have some sample notices on hand. The basic elements of a good public notice should be outlined and placed in this chapter of the O & M Plan so that it will be readily accessible.

A. Information to be Included

Generally, a public notice which fully informs users should include:

- 1. Who The name of the water system;
- 2. What The purpose of the notice, (i.e., the violation, variance, or exemption);
- 3. When The date the violation was observed;
- 4. Authority The name of the government agency that established the regulation;
- 5. Regulation Involved A description of the standard, such as the MCL for nitrates;
- 6. Health Significance Mandatory EPA health effects language for VOCs and other contaminants are to be used;
- 7. Precautions to be Taken (i.e., boiling water in the case of a serious microbiological MCL violation);
- 8. Steps Being Taken to Correct A description of what actions are being taken by the water supplier to correct the problem, such as searching for an alternate source of supply;

- 9. Alternatives Where the customers can obtain an alternate supply of water, if necessary.
- 6.1 Advance Preparations

While public notices cannot be written ahead of time, some arrangements for issuing them can be made in advance and incorporated into the O & M Plan so that when public notification is required, the process can proceed in a smooth and timely manner.

- A. Media Notification
 - 1. Television, Radio, and Newspapers
 - a. Determine in advance what radio and television stations broadcast to the area served by the water system.
 - b. Find out who the contact person at each station is and establish good communications. Include in the O & M Plan the name, address, phone number, and contact person at each station. Inform them of the requirements, advise them of what would be involved on their part, and request information on what the water supplier would need to do in the event that public notification is required.
- B. Direct Notice

Because direct notice to the consumers is required under any circumstance, planning ahead is vital so that the notices can be written, printed, and mailed within the required time frames. Therefore, the O & M Plan should include a billing schedule, so that the determination of whether the notice may be sent with the next bill, whether it must be sent separately may be made; and or whether alternate methods of public notification (i.e., hand delivery or posting in public areas) must be done.

A.7 Staffing and Training

7.0 Staff

The staff of the small groundwater system usually is determined by the size and the amount of revenues which are available for operation of the water system. The very small water system often is operated by one or two employees who must be capable of performing all types of functions. List on the O & M Plan each employee's name, title, experience, and certification.

7.1 Training

Training of the staff in all areas of operations usually will benefit the system and the customers in improved and more economical service. This is especially important when a

one or two-person staff must be capable of performing all functions on the system and to meet the operator certification requirements.

In addition to the requirements for certification, training is available in the areas of hydraulics, mechanics, chemistry, electricity, electronic controls, pump maintenance, chemical feeder maintenance, and system controls operation and maintenance. Courses in human relations, accounting, budgeting, and planning also may be helpful. Training courses and seminars are available through industry organizations (i.e., AWWA, GRWA, GWPCA, etc), the state, equipment manufacturers and colleges.

A.8 Sanitary Survey Program

8.0 General

Water systems must have a sanitary survey conducted of their systems as often as possible, but, at minimum, as frequently as required by the regulations. A sanitary survey is a systematic review of the entire water system facilities to determine if there has been any change in the condition of the land, buildings, water source, treatment process, equipment, or the surrounding area. Any change, from one survey to the next, should be recorded on the sanitary survey form and must be evaluated for its impact on the water system. For example, the deterioration of buildings or equipment can threaten the system's capability to provide quality water and can mean increased maintenance or replacement of facilities. Also, construction of residential, commercial, or industrial facilities near the sources of supply could affect the raw water quality.

For additional information about the sanitary survey requirements and the format used, contact EPD offices.

A.9 Safety Program

9.0 General

Every water system, regardless of size, needs to develop and implement a safety program to prevent injury to its employees and to avoid accidents involving the public. The development of a safety program should include information regarding potential job hazards, preventive safety measures, proper safety and emergency procedures for the use and operation of tools and equipment, and the proper methods of handling and reporting accidents and injuries. One person should be designated the responsibility for overseeing and maintaining the safety program.

9.1 O & M Safety Plan

The O & M Plan should list procedures which have been established as part of the water system's safety program which identifies and describes water system hazards and provides safety measures.

The following sections will not outline the exact safety procedures that should be written in the O & M Plan. Rather, it will serve as a guide for recommended job activities for which

safety procedures should be established and listed in the O & M Plan, as well as other general topics related to the safety program.

A. Identification and Description of Hazards

The safety hazards associated with water supply systems are numerous and varied. Water system personnel should be made aware of all hazards, where these hazards are present in the water system, and how they may affect the employees. The following list identifies some of the general hazards faced by water system employees:

- 1. Bodily injury caused by falls, improper lifting, improper use of tools and equipment, and accidents involving moving mechanical equipment;
- 2. Electrical shock and bums;
- 3. Injury caused by improper chemical handling;
- 4. Exposure to chlorine gas;
- 5. Injury caused by improper entrance into confined spaces;
- 6. Trenching and shoring cave-ins;
- 7. Electrical shock while changing meters.

The O & M Plan also should include a detailed description of each hazard, including where each hazard may be present and what the health risk from each hazard may be to the employee.

B. Recommended Safety Program

Once the job hazards have been identified and described, it is important to outline the proper safety procedures which should be used when performing each job task to reduce these hazards as much as possible. Therefore, the O & M Plan should provide detailed safe operating procedures for specific aspects of water system employee job responsibilities. Recommended safety procedures for each of these water system job tasks can be found in the American Water Works Association's (AWWA's) Manual M3, Safety Practices for Water Utilities, as well as in other reference materials on water supply system operation. Manufacturer's literature also may be a good source of safety procedures for some of the tools, equipment, and machinery.

C. Personal Protective Equipment

The type of personal protective equipment required for each job activity should be outlined. When the wearing of personal protective equipment is specified, it should be made mandatory. The types of personal protection equipment that should be discussed are:

1. Face and eye protection;

- 2. Hand protection;
- 3. Body protection;
- 4. Head protection;
- 5. Foot protection;
- 6. Respiratory equipment;
- 7. Safety belts.
- D. Chemical Handling and Storage

Water supply system personnel are responsible for handling a variety of chemicals, the nature of which depends on the complexity of the water system. In a simple well system, hypochlorite solution may be the only chemical used.

Regardless of the size or complexity of the system, it is important that the employees responsible for handling chemicals are well informed and thoroughly trained in the proper handling and storage procedures for all chemicals used in their particular water treatment process.

E. Right-to-Know Act

A separate section of the O & M Plan, preferably the section immediately before or after the chemical handling section, should be devoted to the Right-to-Know Act. This section should outline the water system's responsibilities as a result of its enactment, and how the supplier complies with the act.

F. Accident and Injury Response and Reporting

Because accidents do sometimes happen even when safety procedures are followed, the safety program also should include a section which provides guidance on procedures which should be followed in the event of an accident or injury. This section should include procedures on accident response, first aid, and accident and injury reporting.

Prepare instructions on procedures to follow when an accident happens, such as who should be notified, administration of first aid and reporting requirements. Include telephone numbers of the supervisor, fire department, ambulance, police department, physician, and poison center.

G. Training

All employees should be encouraged to become trained in the administration of first aid and cardiopulmonary resuscitation (CPR) and advised of where such training is available.

A.10 Emergency Response Plan

10.0 General

Each water system should develop an Emergency Response Plan to prepare for those unexpected emergencies which will at some time occur. It should be prepared to reflect the actual facilities, equipment, personnel, and circumstances for each particular water system.

TECHNICAL INFORMATION

A.11 Sources of Supply

11.0 Wells

Wells are a very common source of supply for small water systems. Wells should be constructed, tested, and operated in accordance with the water works permit and any restrictions imposed by regulatory agencies such as river basin commissions.

A. Records

- 1. Records of the water levels in the well should be recorded frequently. The water level in the well can be observed by inserting a probe into the well which registers when contact with water is made. Continual water level readings can be obtained by employing an air line in the well and a recorder. Air lines do break after a period of time, so sudden changes in the readings or no readings can indicate a damaged air line. Usually the pump has to be removed from the well to replace the air line. Adequate long-term records of flow and level will document the conditions of the aquifer and show the effects of drought, cold weather, and pumping from other nearby wells.
- 2. Records of the water withdrawn should be monitored by a meter. If the meter has a flow recording device, the rates of flow as well as the total flow can be observed. If a recorder is not available, the operator can time the meter for a specific period to determine the rate of pumping. The amount of water pumped is necessary for monthly and/or semi-annual production reports. Careful comparison of the water pumped

and the well levels usually can detect wear on the pump. This could provide a warning of possible pump failure.

- B. Pumps
 - 1. The types of pumps normally used in wells are submersible or vertical turbine. The vertical turbine pumps have the motor mounted on the discharge head and the pump is driven by a shaft. Shafts may be open or enclosed. Enclosed shafts are lubricated by oil; open shafts are lubricated by the water.
 - 2. Maintenance of well pumps usually is performed by the well drilling contractor who has the equipment to pull the pump from the well to work on it. Submersible pumps require no routine maintenance by the operator.

Maintenance of a vertical turbine pump consists of checking the packing gland where the shaft comes through the casing. Packing glands should be checked frequently and never tightened to the point where there is no leakage, since this will cause premature packing wear. When the packing wears or when the gland cannot be tightened any further, a new set of rings should be installed. Other maintenance of vertical turbine pumps is the lubrication of the shaft, if required, and lubrication of the electric motor.

C. Well Bore Maintenance

The yield of the well can be affected by rock fractures, a damaged or clogged well screen, or other causes. The compilation of water level and pumping records provides information which can be evaluated by a qualified hydrogeologist.

D. Water Quality

An analysis of the well water quality should be made annually (at least at intervals required by the regulations) and the results should be compared to the previous results to determine if there is any change in the water quality. This information should be recorded with the sanitary survey. A change in quality can indicate over-pumping of an aquifer, possible pollution or contamination of the source, and the need for additional treatment.

A.12 Treatment

Treatment of the raw water is necessary in water supplies to prevent the transmission of contaminants to the consumer. The contaminants could be toxic, cause disease, or have other long-term health effects for the consumer. Water also must be treated for aesthetic contaminants (i.e., color, taste, odor, and corrosivity) so that the consumer continues to have trust in the quality, taste, and odor of the drinking water. Because of this trust, the water supplier and operators have

a continuing challenge to provide water of the highest possible quality at a time when there is an ever increasing possibility of contamination.

12.0 Disinfection

A. General

The disinfection of water is the selective destruction of pathogenic organisms. The destruction of pathogenic organisms is the destruction of all disease-causing organisms. The total coliform group merits consideration as an indicator of pollution because these bacteria always are present in the normal intestinal tract of humans and other warm-blooded animals. Large numbers of coliform bacteria are associated with fecal wastes. Thus, the absence of total coliform bacteria is evidence of a bacteriologically-safe water.

B. Chemicals

The chemicals used for disinfection are chlorine, calcium hypochlorite, and sodium hypochlorite. There are other chemicals (i.e., iodine, bromine, and ozone) which will disinfect water, but not commonly used in water treatment.

- 1. Chlorine
 - a. General Description

Chlorine is a greenish-yellow gas which has a very penetrating, acrid odor that burns the eyes and the throat. Chlorine gas is two and one-half times heavier than air and, therefore, tends to collect in low areas such as pits, basements, and sumps. Chlorine gas is supplied under pressure in 100 or 150 lb. cylinders or in 2000 lb. containers.

The chlorine cylinders must be protected from exposure to heat because a rise in temperature can cause an increase in pressure which could rupture the steel cylinders. The cylinders are equipped with a fusible plug which softens and melts at 158° F to 165° F to prevent the buildup of pressure.

Chlorine cylinders must be secured in an upright position to prevent failing over and damaging the valve. Also, the valve should be protected with a protective cap when not actually in use.

b. Method of Feeding

The chlorinators used to feed the chlorine are vacuum controlled so that the chlorine gas only can be released when a vacuum is present. The chlorine gas then is injected into a stream of water at the injector. The flow of water through a small orifice in the injector creates the vacuum which draws the chlorine gas

into the stream of water. The solution of chlorine and water then is conveyed to the point of application.

A typical chlorinator has a pressure-reducing valve to reduce the chlorine gas pressure, a rate valve and rate meter to control the rate of flow, and a valve which shuts off the supply of chlorine gas when a vacuum is not present.

c. Determination and Control of Feed Rate

The amount of chlorine applied to the clear well, or point of discharge to the distribution system, should provide a detectable residual of free chlorine in the recommended amount of at least of 0.2 mg/L at all parts of the distribution system. This may require a feed rate of 1 to 2 mg/L at the clear well due to long transmission mains and distribution storage facilities. Where chlorine is added at points in the distribution system, the goal also is to maintain a detectable (recommended amount of 0.2 mg/L) chlorine residual in the distribution system. This may require the application of 0.5 to 1.0 mg/L.

The rate of feed in a gas chlorinator is controlled by a flow rate adjusting valve, and a rate meter indicates the rate of flow. In some installations, there may be chlorine residual monitoring equipment which automatically paces the rate of feed to maintain a specific chlorine residual at a specified location downstream from the point of application.

- d. Precautions and Abnormal Situations
 - Chlorine gas is extremely toxic and can cause death when inhaled. All safety precautions must be observed.
 - Exhaust fans should be used to ventilate the chlorine room in the event of a leak. Ideally, fans should push air into the room from the ceiling or a high point on a wall and the exhaust must be from the floor level. This prevents the chlorine gas from passing over the fan and motor. Chlorine gas is very corrosive, and can damage the fan and the motor.
 - Self-contained breathing apparatus is to be used if there is any suspicion of a leak.
 - Chlorine leaks can be checked by use of a rag on a stick dipped in ammonia. When passed near the chlorine leak, a white vapor will form.
 - When a leak is suspected, always work with a backup person to help you out if you are overcome.
 - When a leak cannot be repaired and could become a threat to the area, contact the fire department for help.
 - If a chlorine cylinder or container is leaking, call the supplier for help.
 - Avoid drawing more than 40 lbs. of chlorine per day from any one cylinder. If more chlorine is required, the withdrawal should be from multiple cylinders manifolded together.
- 2. Calcium Hypochlorite and Sodium Hypochlorite
 - a. General Description

Calcium hypochlorite is a dry, white chemical in granular or tablet form. When used for disinfection, it should be mixed in a solution of water and fed by solution pump into the water to be treated.

Sodium hypochlorite is a light yellow liquid which is commonly used as bleach; however, the concentration of sodium hypochlorite used in water treatment is much higher (up to 15 percent). The liquid usually is supplied in five-gallon carboys; however, some smaller systems purchase one-gallon containers.

b. Method of Feeding

Both calcium hypochlorite and sodium hypochlorite solutions are fed by means of a metered solution pump. The powder or the liquid is diluted with water in a solution crock to a predetermined strength, usually about a one percent solution.

c. Determination of Feed Rate

The amount of calcium hypochlorite or sodium hypochlorite applied to the water is determined by the free chlorine residual which is necessary to provide adequate disinfection of the water and maintain a detectable residual in the recommended amount of at least 0.2 mg/L at any point in the distribution system. Each system will have developed criteria to determine the necessary chlorine residual at the point of application. However, the temperature, pH, and any organic substances in the water must be considered when setting application rates.

- d. Precautions and Abnormal Situations
 - Calcium hypochlorite is a dry powder which does not fully dissolve in water; therefore, a sediment of undissolved chemicals is present in the bottom of the solution tank. Because of this, the pump suction line should be kept off the bottom to prevent this sediment from being drawn into the pump.
 - The hypochlorite solutions are very corrosive and should not be in contact with metals.
 - The hypochlorite solutions are very strong alkali bleaches which can be a skin irritant. The eyes should be protected from solution splashes or airborne powder (dust).

12.1 Corrosion Control

A. General

Water sometimes is unstable due to low pH, high level of dissolved oxygen, and low alkalinity. This results in chemical reactions causing tuberculation which is the buildup of corroded materials on the inside of the pipes. This buildup reduces the cross-sectional area of the pipe and available flow. The roughness of the buildup requires more energy, increasing pumping costs.

The corrosivity in water usually is evidenced by the visual observation of the effects of corrosion on metal pipes when they are excavated for repairs or replacement. Customer complaints of dirty water is another indication of corrosive water. Records of customer complaints, plotted on a system map, can help locate the problem. If the Langelier Index indicates a corrosive water, a further study by an engineer will confirm or deny the condition. The engineer will probably have additional tests performed such as dissolved oxygen and marble tests. The engineer also may have special steel specimens called "coupons" inserted into the water mains at various locations in the system. After a period of time, usually several months, the coupons are removed and examined for loss of weight and corrosion. The examination of the results of these tests will enable the engineer to evaluate the corrosivity of the water throughout the system and make recommendations for treatment procedures.

Corrosion can cause metals in the pipe materials, (i.e., iron, lead and copper) to deteriorate and go into solution. These metals carried by the water are then consumed by the customer. The iron in the water usually is noticeable in rust stains on clothing. Lead in drinking water is not noticeable to the consumer, but present in concentrations higher than the action level, is a health hazard.

B. Cause

Corrosion in pipes is caused by reactions between water and the metal in the pipe. This appears as rust and tuberculation (buildup of rust). Some of the factors which affect the rate of corrosion are:

- 1. Temperature Higher temperatures cause more rapid chemical reactions (i.e., reactions which occur inside hot water tanks);
- 2. Low pH;
- 3. Low alkalinity;
- 4. Velocity Corrosive water at high velocity causes rapid pipe deterioration but shows little metal pickup. Low velocity with more contact time will have more metal pickup resulting in red water,
- 5. Galvanic corrosion When two different metals come into contact, there is a chemical reaction which produces a flow of electrons from one metal to the other, causing corrosion;
- 6. Dissolved gases Oxygen increases the rate of corrosion. Carbon dioxide reduces pH and increases corrosion. Nitrogen tends to lower corrosion rates.
- C. Tests

The tests which are used to monitor the corrosivity of the water are temperature, pH, alkalinity, dissolved oxygen, and hardness. The results of these tests can be used to calculate a Langelier Index (LI) for the water. If the LI has a negative value, the water is aggressive. A value of -1.0 to -2.0 indicates the water is moderately aggressive and a value greater than

-2.0 means the water is highly aggressive. A value of zero or a positive value indicates the water is nonaggressive and will tend to form a scale on the pipes. The calculation of the Langelier Index should be made by a qualified laboratory on a quarterly basis. The laboratory also should determine, for the water system, the correct ranges of pH and alkalinity to produce a water which is nonaggressive.

Based on the information provided by the results of these tests, the water system can then determine what chemicals and what feed rates are necessary to provide nonaggressive water.

A.13 Distribution

The distribution system includes the conveyance of water from the source to the customer including pumping, transmission mains, distribution mains, valves, fire hydrants, customer service lines, and distribution system storage.

The water must be delivered in the same potable, ready-to-drink condition that it left the treatment facility. To protect the water quality, the water distribution workers must at all times protect the water from any type of pollution or degradation.

- 13.0 Plans and Records
 - A. Distribution System Maps

When water mains are installed, a plan of the pipe and fittings must be drawn to establish a record of the facilities installed. This information should be either added to the existing plans or a new plan should be started which would be referenced to the overall system plans. A system should be established for all distribution system plans so that they are of the same scale and fit together to cover the entire system.

B. Locations of Pressure Zones

On the system plans, the normal operating pressures should be indicated at typical locations such as fire hydrants and customer services. These pressures are useful in comparing operating conditions when there is a suspected leak in the system. These pressures also become a part of the pressure surveys required annually by the Safe Drinking Water Act.

Sometimes a water system must be divided into different pressure zones so that customers at higher locations have adequate pressures for the service they desire. Also, customers and water mains at lower elevations must be protected from excessively high pressures which could break mains and customers' pipes and cause damage. To establish these pressure zones, the water system may have booster pump stations which pump the water to a higher elevation or the water system may have pressure-reducing stations which reduce the high pressure to a lower, acceptable level. The pressure zones should be clearly marked on the system maps so that inadvertent flow between the zones does not occur. Also, all valves which normally should be closed to separate the pressure zones should be clearly marked on the plans as normally closed. C. Updating and Correcting Plans

When additions or changes are made to the system, the plans should be updated and corrected. At least once per year, all original plans should be updated and new prints issued to the appropriate field personnel. The original plans should be kept in a safe location to guard against loss or damage.

D. Production and Pumping Records

A record of the amount of water produced, the chemicals used in treatment, and the water pumped should be kept for the system. These records provide a history of the operation and indicate the demands of the system and the costs of operation. A comparison of records can be used to identify suspected system problems such as increased pumping or treatment costs or possible loss of water.

The records should indicate the water in the system storage facilities so a daily system use can be developed. A system of keeping records on a month-to-date basis and a daily-average-use basis should be established so they can be compared to previous years' performance.

13.1 Distribution System Components

All materials that come into contact with the drinking water during its treatment, storage, transmission or distribution must be certified for conformance with American National Standards Institute/ National Sanitation Foundation Standard 61 (ANSI/NSF Standard 61).

The pipe, fittings, valves and fire hydrants must conform with the latest AWWA Standards. In the absence of such standards, pipe meeting applicable ASTM and ANSI criteria and acceptable to the EPD may be selected.

A. Transmission and Distribution Mains

There are many materials used in transmission and distribution mains; some of the more common are as follows:

- 1. Cast Iron The older pipe usually had bell and spigot joints which used jute and lead to make a water tight joint. Because of labor and skill is needed to pour a lead joint, this type of pipe is no longer commonly used. The more modern joints for cast iron pipe and ductile iron pipe are rubber gasketed joints which provide a simple seal and can be easily installed.
- 2. Concrete Concrete pressure pipe has been used for transmission mains because of its long life. It normally is only available in larger diameters and is difficult to make connections. The joints usually are seated with an O-ring rubber gasket.

- 3. Asbestos Cement Asbestos cement pipe was used extensively from 1940 to 1980 as a less expensive material. This pipe can release asbestos fibers to the water if the water is aggressive. This material is no longer installed on water systems.
- 4. PVC (Polyvinyl Chloride) PVC pipe is the less expensive substitute for the ductile iron pipe. This pipe is light in weight and easy to handle and join. It is subject to damage by exposure to sunlight, and petroleum products can penetrate the through the wall of the PVC pipe.

B. Valves

There are several types of valves normally used in transmission and distribution systems. Some are used for normal control and others have special purposes.

- 1. Gate Valves Gate valves are the most commonly used valve in water systems. These valves have proven to be most reliable and maintenance free. Maintenance should consist of exercising the valve periodically to keep the threads clear of buildup and checking the valve stem seals.
- 2. Butterfly Valves Butterfly valves are frequently used for the regulation of flow. These valves have a wafer which rotates in the water stream from fully open to fully closed. The wafer usually has a rubber gasket on its sealing edge. Maintenance consists of replacement of the gasket when it becomes worn.
- 3. Check Valves Check valves are used to control the flow in only one direction. This normally is done by having a hinged flapper which the flow of water will move out of the water flow area. When the flow of water attempts to reverse, the flapper is returned across the flow on to the valve seat stopping the flow. The movement of the flapper is caused by the reverse flow of water, exterior springs, or gravity. There are other configurations of check valves which are designed for special purposes.
- 4. Pressure Relief Valves Pressure relief valves are used to bleed off a flow of water to relieve a high pressure surge condition. Surges of water, such as from the start-up of a pump, can cause high pressures which could damage pipe and facilities.
- 5. Pressure Reducing or Pressure Regulating Valves These valves are normally used to maintain a specific pressure on the downstream side of the valve and to control the pressures in various pressure zones of the distribution system. This action is accomplished by a diaphragm which controls the position of the valve disc. These valves, because of their constant movement, require frequent maintenance to keep them working

and in adjustment. The items needing attention are the strainers, needle valves, pilot valves, and the main diaphragm.

- 6. Air Relief Valves Air can cause serious pipeline problems by restricting the flow. Air can get into the water system through pumps, packing glands, and leaking joints. These valves are installed at the high points on the system and are simple float valves which release air until the water enters the valve body and raises the float.
- 7. Plug or Ball Valves This type of valve normally is used on customer service lines. These valves are maintenance free and cause little flow resistance when fully open.
- 8. Globe Valves Globe valves cause the water to flow up through an orifice. These valves are rarely used in water systems due to their resistance to flow and high maintenance requirements.
- 9. Altitude Valves Altitude valves are used to control the height of water in distribution storage tanks. These valves open when the system pressure drops and water flows out of the tank. When the system pressure increases, the water flows into the tank until the tank is nearly full. The altitude valve then closes. This valve is very similar in operation and maintenance to a pressure reducing valve. Maintenance consists of checking the strainers, diaphragms, small piping, and needle valves.
- C. Fire Hydrants Fire hydrants are used to provide access by fire fighting personnel to the water system. Fire hydrants have an underground valve and a barrel to deliver the water to hose nozzles above the ground. Fire hydrants in Pennsylvania must be of the dry barrel type because of the danger of freezing. Dry barrel hydrants are designed to automatically drain the water from the barrel when the hydrant is shut off. Fire hydrants usually are manufactured so maintenance of the valve can be accomplished without excavation. All fire hydrants should be equipped with a gate valve on the lateral pipe leading from the water main. This valve will permit the water distribution crews to shut off the hydrant for maintenance. Fire hydrants should be flushed and checked at least semi-annually for proper operation, particularly that they shut off completely and that the hydrant barrel drains.

Flushing the hydrants also helps to clear any sediment from the distribution system. Fire hydrants require frequent maintenance because they are frequently operated, often by untrained personnel. The parts which often need attention are the valve seats, which are resilient rubber; the valve stem packing, which will leak; and the stems, which become twisted due to turning too tight.

A cooperative effort between the fire fighting personnel and the water system will help reduce hydrant damage and affect prompt repairs when needed. When a hydrant is taken out-of-service, the local fire company or municipality should be given notification. A record book should be kept specifically for hydrants taken out-of-service. It should contain information on the date the hydrant was

taken out-of service, the time, the hydrant number and location, the municipality, the employee's name who took it out of-service, the name of the person notified, the date returned to service, the time, and the person notified.

- D. Blow-offs Blow-offs are a tee and valve arrangement at locations where fire hydrants do not adequately flush the system. These usually are dead ends or at locations which, due to topography, require frequent flushing such as at low points. These blow-offs must have their flow directed so that no damage occurs. The blow-offs must be located deep enough to prevent freezing and the discharge pipe should have a small hole drilled to permit draining of the pipe extending to the surface.
- E Records Records of the locations of all valves, fire hydrants, and blow-offs must be indicated on the system plans. Records of the operation and any maintenance performed must be kept. This information is useful in planning replacement of facilities due to age.
- 13.2 Pumps

Pumps are used in water systems to move water from one location to another and to add pressure to the water by pumping it to a higher elevation. The common uses of pumps in water systems are well pumps, chemical feed pumps, high service pumps, booster pumps, and fire service pumps.

A. Types of Pumps

Centrifugal pumps are the most common type of pump used in water systems. These pumps have the ability to adjust to varying head and flow conditions and are available in a wide variety of configurations manufactured to meet specific conditions.

The other type of pump used is the positive displacement pump which is used for feeding chemicals. These are either diaphragm type or piston type which delivers a measured volume with each revolution or cycle.

B. Capacities and Purposes

The capacities (flow and head) of each type of pump should be matched to its purpose. The capacity of each pump should have been specifically selected when the design of the system or the component was done by the engineer. However, as system components and uses change, so do the capacities and operating conditions for pumps. Therefore, the water system operator should know the flow and head (pressure) the pump was selected for and should periodically test the pumping unit for the present operating conditions. The operator should plot the results of the pump tests on the pump operating curve to determine if the operating point has changed from the design conditions and what the expected efficiency should be.

1. Well Pumps

Well pumps are usually of a vertical turbine configuration and have multiple stages. However, the smaller water systems that use low capacity wells are usually equipped with submersible pumps. The well pumps can be driven by a shaft extending down the column from a motor located on the surface or by a submersible motor attached directly on the pump and suspended in the well on the end of the column pipe.

Well pumps should have their capacity matched to the capacity of the well so that the well is not overpumped causing excessive drawdown of the aquifer which can cause a deterioration of the water quality. If the water is lowered to a level near the pump impellers, the pump also can be damaged. The capacity of the pump (flow and head) would have been selected at the time the well was initially pump tested and put in service. As the pumping level would lower, due to depletion of the aquifer, the head would increase and the flow would decrease. The operator should be aware of the original conditions and should monitor the pumping water level in the well through the use of an air line or level sensing equipment.

2. Chemical Feed Pumps

Chemical feed pumps usually are positive displacement type; however, they can be centrifugal. Since these pumps are comparatively small compared to other pumps and motors, operating efficiency usually is not a consideration for these pumps.

Chemical feed pumps must reliably deliver specific volumes of solutions at required pressures; any failures could affect the treatment process. For this reason, the water supplier should have spare pumps and parts for repairs available.

3. High Service Pumps

High service pumps pump the finished (potable) water from the clear well to the transmission distribution system. These pumps are usually high capacity and high head. There should be at least duplicate units for reliability.

The water pumped is clean and clear and should not produce any excessive wear on the pump parts. These pumps run for long periods of time; therefore, maintenance of bearings and shaft seals is important. The alignment between the pump and the motor also should be checked since misalignment can cause excessive wear on the pump and motor bearings.

4. Booster Pumps

Booster pumps are the same type of service as high service pumps except these usually are located at various points in the distribution system to pump water to higher pressure zones. The operation and maintenance of these pumps would be the same as high service pumps.

5. Fire Service Pumps

Fire service pumps are the same as high service pumps or booster pumps except these pumps are set with automatic controls for start-up to meet the specific requirements of a large fire flow. These pumps are of high capacity and have only occasional use. The maintenance of these pumps must include checking the controls and actually operating the pumps to verify their reliability of service. All other maintenance is the same as a high service pump.

C. Reports of Operations and Maintenance

A record of the hours of operation for each pumping unit should be maintained. This record can be used for planning preventive maintenance of the units. A record of the maintenance and the cost of repairs will help to evaluate the units when they are being considered for repair, rebuilding or replacement.

D. Monitoring of Pumping Operations

There are many systems for the monitoring and controlling of pumping systems. These vary from very simple manual operation to complete automation. The following are examples of typical monitoring and control systems:

- 1. The simplest system would be a manual on/off switch with an indicating pressure gauge and a water meter. This is typical of many small systems with a well, distribution system, and a tank. The operator usually knows the system very well and can adjust the pumping according to the system needs.
- 2. A system with a tank level recorder, a pressure recorder, and a flow recorder with automatic pump operation would provide the operator with records and reliability of operation.
- 3. Where there are various pressure zones on a distribution system, the operation of booster pumps is used to transfer water from one part of the system to another. This type of system requires careful monitoring and usually automatic controls. The information on the operating conditions (i.e., tank levels, system pressures, pump flows) must be transmitted to an operations control center so the operator can make decisions which will be best for the entire system.
- 4. There are interlocking controls which will stop the pump operation if the water pressure on the suction side of the pump drops below a predetermined value or will shut off the pump if the discharge pressure exceeds a predetermined value. There are continuous monitors

available for chlorine residuals which have the capability of interrupting the pumping operation when certain values are exceeded or not met.

13.3 Distribution Storage Facilities

Distribution storage facilities can be in-ground earthen, concrete, brick, or steel reservoirs; above-ground steel or concrete tanks; or either standpipes or elevated. These storage facilities are all used to store treated water for use in the distribution system. The construction and design of these facilities must conform with the Georgia Rules for Safe Drinking Water, Chapter 391-3-5, and the EPD's "Minimum Standards for Public Water Systems".

Distribution storage has several purposes such as to provide sufficient water for peak demands which may exceed the pumping capacity, to supply large volumes of fire protection water, and to provide reliability when pumps must be removed from service for maintenance.

A. Maintenance

Maintenance of distribution storage reservoirs will depend on the type of material used for construction.

1. Steel Reservoirs or Tanks

Steel reservoirs should be painted inside and out with an acceptable paint system. The paint system used on the interior surface of the tank must be certified as meeting the NSF Standard 61 and must be acceptable to EPD. Some types of paint can transfer substances to the water which may be toxic or can cause foul tastes and odors in the water.

The paint system will protect the steel structure from deterioration and thus extend its useful life. A good paint system should last from eight to 15 years. The atmospheric conditions in the area can have an effect on the life of the paint system. For example, in industrial areas, the paint will have a shorter life and in rural areas, a longer life.

2. Concrete Tanks

Concrete tanks can be treated with a waterproofing system which will seal the surface cracks and stop any leakage, and extend the life of the structure. All materials applied must be approved by EPD as noted above. It is required that all products that come into contact with the drinking water must be certified as meeting the NSF Standard 61.

3. Ground Reservoirs

Ground reservoirs can be concrete, brick, or steel construction at ground level or below ground. Some typical installations are of concrete, masonry, or brick construction. These reservoirs must be properly constructed to prevent potential entry of any contaminants.

B. Safety Protection

Access to water system storage facilities can be a safety hazard, and proper precautions must be taken to protect the public and the employees from injury.

- 1. Where open storage reservoirs exist, there is the danger of someone falling into the water and drowning. These facilities should be securely fenced to prevent unauthorized entrance, and all employees working around these facilities should use life vests or other flotation devices.
- 2. All on steel storage tanks should terminate at a safe distance above ground, be caged, and with a locked gate to prevent access by unauthorized personnel. All ladders should be caged for their full height or a safety harness should be provided.
- 3. No entrance to a tank should be made by any personnel without first checking for dangerous vapors, fumes, or gases. Also, do not enter a tank without a safety harness and rope tended by a fellow employee from the outside of the tank.
- 4. Fences around all storage facilities are recommended to prevent unauthorized access and possible vandalism.
- C. Storage Facilities Information
 - 1. A record should be kept showing the location, year built and by whom, elevation at the base of the tank and the top of the overflow pipe, the size of the diameter and the height, and the capacity in gallons.
 - 2. Painting records of the interior and exterior showing the year painted, type of paint, and the square foot area for painting. This information will be useful when setting painting budgets.
 - 3. Altitude Valve Records

The type and size of the altitude valve should be noted, along with the type and number of the leathers needed to make repairs, the date repairs were made, and any parts that were used.

13.4 Unaccounted-for Water

Unaccounted-for water is water which is produced but is not used or sold to the consumers. There are many factors which are considered in the determination of the percentage of unaccounted-for water. This percentage is a measure of the efficiency of the operation of the system.

A. Factors to Consider

Factors to consider in the determination of the unaccounted-for water are:

- 1. The water produced Is this quantity accurately deter-mined, has the meter been calibrated, and does the meter measure all of the water?
- 2. The water used for water system purposes such as chemical feed water, backwash water, fire hydrant and blow-off flushing - How is each of these uses measured? Careful accounting in the treatment plant is necessary because, in some plants, plant use water is used before the master meter, and in other plants, it is used after the master meter.
- 3. The water sold or used by the consumer A meter testing program should be in place to periodically test the accuracy of the meters. All consumer use must be accounted for. For example, free water may be provided for parks, cemeteries, or for municipal purposes at sewage treatment plants, borough buildings, and fire companies. All of this water must be measured and accounted for.
- 4. Water used for fire fighting purposes This water only can be estimated, but some careful calculations by the fire company and the water system can develop a reasonable value.
- B. Basic Calculation

The basic calculation is:

- (Water Available for Sale) (Water Sold or Used) x 100 = Percent of Unaccounted for Water Water Available for Sale
 - 1. The water available for sale is the water produced, adjusted for the company uses of water, as follows:
 - a. Subtract any plant use water that is taken off the system after the master meter,
 - b. Subtract any water used on the distribution system for flushing fire hydrants and blow-offs and for fire protection.
 - 2. The water sold or used is the total quantity of water sold to customers through meters plus an estimate of all unmetered uses either to flat rate customers or for public purposes.
 - 3. When making the calculation, the time interval must be considered since the amount of water sold only may be determined monthly, quarterly, or annually, and usually all meters are not read on the same day or at the same time. It is recommended that a one-year (four-quarters or 12months) period be considered since this will level off the variables for

meter reading, and seasonal variations. This calculation can be made on a monthly basis by using the totals for the previous 12 months.

C. Normal Operating Ranges

The normal operating range should not exceed 10 percent for a well maintained system. There are many factors which should be considered when determining what an acceptable percent of unaccounted-for water is for a particular system. These are:

- 1. The age and condition of the system. A very old water system which has deteriorated pipe will have many undetected leaks at joints. Although the goal may be the 10 percent, it only can be accomplished by replacing large segments of the system. Therefore, a range of 35 to 40 percent may not be unusual until funds for replacement of mains are available.
- 2. The pressure in the system can affect the rate of leakage. Thus high pressure systems may have a higher percentage of unaccounted-for water.
- 3. The number of customers per mile of main can affect the unaccountedfor water. Therefore, if a system has a high ratio of miles of pipeline to the number of customers, the percentage of unaccounted-for water will increase.
- 4. Under-registration of customer meters or unauthorized use can increase the percentage of unaccounted-for water.
- D. Control of Unaccounted-for Water

To reduce the percentage of unaccounted-for water, the following are suggested actions:

- 1. Calculate the cost of producing 1,000 gallons or 100 cubic feet of water and then calculate the amount of money which is being "lost" as unaccounted-for water each month. By identifying this cost, you can justify the cost of the programs to correct the problem.
- 2. A meter testing program should be installed to test the master meter and other system meters at least annually and to test all customer meters (on a continuing basis) at least once every 20 years.
- 3. An adequate leakage control program includes:
 - a. A program of listening to all fire hydrants valves and services to detect leaks;
 - b. The use of detector type meters on fire lines;

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- c. Training personnel to listen for leaks and to detect unauthorized use of water
- d. Review of meter readings to detect stopped meters or obvious under-registering meters.
- 4. A record of leaks repaired and the estimated amount of water lost at each leak can help to justify replacement of sections of mains which have a high incidence of leakage.

A.14 Laboratory Equipment Maintenance

In water treatment, the instruments and equipment used to take water quality measurements are critical for the monitoring quality of the water produced and protecting the health of the consumer. Maintenance of this equipment assures that it is working correctly and providing accurate results. Since this equipment often is supplied by several different manufacturers and is of differing types, it is important to keep copies of the manufacturer's maintenance recommendations and operating procedures available in the O & M Plan for reference. The routine maintenance section of the O & M Plan should include a routine maintenance schedule for the monitoring equipment.

14.0 Colorimetric Comparators or Photometric Instruments

There are other types of testing equipment available; however, most small systems will use this color comparator type of testing.

A. General

A reagent is added to a specific volume water sample. The reagent reacts with the parameter to be measured producing a specific color. The intensity of the color indicates the relative value of the parameter present in the water sample. The color intensity is compared with a standard set of colors and the matching color is selected. The value of the matching color is the quantity of the parameter present in the sample. In a photometric instrument, light is passed through a color filter. The sample and a photoelectric cell measures the light intensity, producing a numerical value which is indicated on a graduated scale or produces an electronic digital readout representing the value of the parameter present in the sample.

B. Common Tests for Small Systems

The most common uses for a colorimetric comparator or photometric instrument is the measurement of residual chlorine. The DPD color comparator test kit is the simplest, acceptable, and quickest way to test for residual chlorine. Adhere to the instructions supplied with the kit. - THE END -

RULES

OF DEPARTMENT OF NATURAL RESOURCES ENVIRONMENTAL PROTECTION DIVISION CHAPTER 391-3-5 RULES FOR SAFE DRINKING WATER

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391-3-5-.01 Purpose. Amended.

The purpose of these Rules is to establish policies, procedures, requirements and standards to implement the Georgia Safe Drinking Water Act of 1977 (Act No. 231 O.C.G.A. Section 12-5-170 *et seq.*, as amended), and to carry out the purposes and requirements of the Federal Safe Drinking Water Act (PL93-523). These Rules are promulgated so that the citizens of the State of Georgia shall be assured adequate, safe drinking water of the highest quality. Any reference in these Rules to standards, procedures and requirements in other sources is a specific adoption and incorporation by reference of that source for such standard, procedure, or requirement for purposes of these rules.

Authority Ga. L. 1977, p. 351, *et seq.*, O.C.G.A. Sec. 12-5-170 *et seq.*, as amended. **History.** Original Rule entitled "Definitions" was filed on September 6, 1973; effective September 26, 1973. **Amended:** Rule repealed and a new Rule entitled "Purpose" adopted. Filed July 5, 1977, effective July 26, 1977, as specified by Rule 391-3-5-.47. **Repealed:** New Rule of same title adopted. F. May 12, 1989; eff. Jun. 1, 1989. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.02 Definitions. Amended.

All terms used in these rules shall be interpreted in accordance with the definitions as set forth in the Georgia Safe Drinking Water Act of 1977 or as herein defined:

(1) "Act" means the Georgia Safe Drinking Water Act of 1977, as amended.

(2) "Action Level" means the concentration of a contaminant, which if exceeded, triggers treatment or other requirements which a water system must follow.

(3) "Aquifer" means any stratum or zone of rock beneath the surface of the earth capable of containing water or producing water from a well.

(4) "Aquifer Testing" means a controlled pumping test of a well lasting at least 24 continuous hours in which the water level and the pumping rate are monitored at closely spaced intervals and the water level is monitored for at least as long a time following the test as the duration of the test.

(5) "Backflow" means the reverse flow of contaminated water, other liquid, gas, or substance into the distribution system of a potable water supply.

(6) "Back pressure" means a condition in which the pressure in a non-potable system is greater than the pressure in the potable distribution system and can cause contaminants to backflow into the potable system.

(7) "Backsiphonage" means a form of backflow caused by a negative or below atmospheric pressure within the potable water system.

(8) "Bag filters" are pressure-driven separation devices that remove particulate matter larger than 1 micrometer using an engineered porous filtration media. They are typically constructed of a non-rigid, fabric filtration media housed in a pressure vessel in which the direction of flow is from the inside of the bag to outside.

(9) "Bank filtration" is a water treatment process that uses a well to recover surface water that has naturally infiltrated into ground water through a river bed or bank(s). Infiltration is typically enhanced by the hydraulic gradient imposed by a nearby pumping water supply or other well(s).

(10) "Business plan" means a written plan which is prepared to demonstrate a public water system's managerial and financial capacity to comply with all drinking water regulations in effect, or likely to be in effect. The business plan is to be prepared in conformance with Appendix A of the Division's "Minimum Standards for Public Water Systems", latest edition. The business plan shall be updated at intervals determined by the Director.

(11) "Best Available Technology" or "BAT" means the best technology, treatment techniques, or other means promulgated by EPA and adopted by the Division. In promulgating BAT the EPA examines the efficacy under field conditions and not solely under laboratory conditions, and takes costs into consideration when determining what technology or treatment technique is available.

(12) "CFR" means the Code of Federal Regulations, Title 40. The Code of Federal Regulations is a codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the federal government.

(13) "Capacity" means the overall capability of a water system to reliably produce and deliver water meeting all national primary drinking water regulations in effect, or likely to be in effect. Capacity encompasses the technical, managerial, and financial capabilities, as described in the latest edition of EPD's "Minimum Standards for Public Water Systems" and will enable a water system to plan for, achieve, and maintain compliance with applicable drinking water standards.

(14) "Cartridge filters" are pressure-driven separation devices that remove particulate matter larger than 1 micrometer using an engineered porous filtration media. They are typically constructed as rigid or semi-rigid, self-supporting filter elements housed in pressure vessels in which flow is from the outside of the cartridge to the inside.

(15) "Casing" means the tubular material used to shut off or exclude a stratum or strata and to protect against entrance of contaminants during the expected life of the well.

(16) "Coagulation" means a process using coagulant chemicals and mixing by which colloidal and suspended materials are destabilized and agglomerated into flocs.

(17) "Combined distribution system" is the interconnected distribution system consisting of the distribution systems of wholesale systems and of the consecutive systems that receive finished water.

(18) "Community water system" or "CWS" means a public water system, which serves at least 15 service connections, used by year-round residents or regularly serves at least 25 year-round residents.

(19) "Compliance cycle" means the nine-year calendar year cycle during which public water systems must monitor. Each compliance cycle consists of three-year compliance periods. The first compliance cycle begins January 1, 1993.

(20) "Compliance period" means a three-year calendar year period within a compliance cycle. Each compliance cycle has three-year compliance periods.

(21) "Comprehensive performance evaluation" or "CPE" means a thorough review and analysis of a treatment plant's performancebased capabilities and associated administrative, operation and maintenance practices. It is conducted to identify factors that may be adversely impacting a plant's capability to achieve compliance and emphasizes approaches that can be implemented without significant capital improvements. For purpose of compliance with subparts P and T of 40 CFR Part 141, the CPE shall consist of at least the following components: Assessment of plant performance; evaluation of major unit processes; identification and prioritization of performance limiting factors; assessment of the applicability of comprehensive technical assistance; and preparation of a CPE report.

(22) "Confirmation Sample" means a sample analysis or analyses taken to verify the results of an original analysis. Each sample for the analysis shall be taken or measured at the same location in the water system as the original sample. The results of the confirmation samples shall be averaged with the original sample to determine compliance.

(23) "Confined Aquifer" means an aquifer which is separated from the land surface by a significant zone of low permeability which prevents surface recharge or pollutants from readily reaching the aquifer.

(24) "Confluent growth" means a continuous bacterial growth covering the entire filtration area of a membrane filter, or a portion thereof, in which bacterial colonies are not discrete.

(25) "Consecutive system" is a public water system that receives some or all of its finished water from one or more wholesale systems. Delivery may be through a direct connection or through the distribution system of one or more consecutive systems.

(26) "Consumer Confidence Report" means an annual report that community water systems must deliver to their customers which, as a minimum, contains information on the quality of the water delivered by the system and characterizes the risks (if any) from exposure to contaminants detected in the drinking water in an accurate and understandable manner.

(27) "Contaminant" means any physical, chemical, biological, or radiological substance or matter in water.

(28) "Conventional filtration treatment" means a series of processes including coagulation flocculation, sedimentation, and filtration resulting in substantial particulate removal.

(29) "Corrosion Inhibitor" means a substance capable of reducing

the corrosivity of water toward metal plumbing materials, especially lead and copper, by forming a protective film on the interior surface of those materials.

(30) "Cross-connection" means any physical arrangement whereby a public water supply is connected, directly or indirectly, with any other water supply system, sewer, drain, conduit, pool, storage reservoir, plumbing fixture, or other device which contains or may contain contaminated water, sewage or other waste, or liquid of unknown or unsafe quality which may be capable of imparting contamination to the public water supply as the result of backflow. By-pass arrangements, jumper connections, removable sections, swivel or changeable devices, and other temporary or permanent devices through which or because of which backflow could occur are considered to be cross-connections.

(31) "CT" is the product of "residual disinfectant concentration" (C) in milligrams per liter determined before or at the first customer tap where water is provided for human consumption and the corresponding "disinfectant contact time" (T) in minutes.

(32) "Department" means the Department of Natural Resources of the State of Georgia.

(33) "Diatomaceous earth filtration" means a process resulting in substantial particulate removal in which (1) a pre-coat cake of diatomaceous earth filter media is deposited on a support membrane (septum), and (2) while the water is filtered by passing through the cake on the septum, additional filter media known as the body feed is continuously added to feed water to maintain the permeability of the filter cake.

(34) "Direct filtration" means a series of processes including coagulation and filtration but excluding sedimentation resulting in substantial particulate removal.

(35) "Director" means the Director of the Environmental Protection Division, Department of Natural Resources of the State of Georgia, or his designee.

(36) "Disinfectant" means any oxidant, including but not limited to chlorine, chlorine dioxide, chloramines, and ozone added to water in any part of the treatment or distribution process, that is intended to kill or inactivate pathogenic microorganisms.

(37) "Disinfectant contact time" ("T" in CT calculations) means the time in minutes that it takes for water to move from the point of disinfectant application or the previous point where residual disinfectant concentration ("C") is measured.

(38) "Disinfection" means a process, which inactivates pathogenic organisms in water by chemical oxidants or equivalent agents.

(39) "Disinfection profile" means a summary of *Giardia lamblia* inactivation through the treatment plant. The procedure for developing a disinfection profile is contained in 40 CFR § 141.172. (Disinfection profiling and benchmarking) in subpart P and 141.530- 141.536 (Disinfection profile) in subpart T of 40 CFR Part 141.

(40) "Division" means the Environmental Protection Division, Department of Natural Resources of the State of Georgia.

(41) "Domestic or other non-distribution system plumbing problem" means a coliform contamination problem in a public water system with more than one service connection that is limited to the specific service connection from which the coliform-positive sample was taken.

(42) "Dose equivalent" means the product of the absorbed dose from ionizing radiation and such factors as account for differences in biological effectiveness due to the type of radiation and its distribution in the body as specified by the International Commission on Radiological Units and Measurements (ICRU).

(43) "Drinking Water" means water supplied to the public for human consumption from a public water system.

(44) "Dual sample set" is a set of two samples collected at the same time and same location, with one sample analyzed for TTHM

and the other sample analyzed for HAA5. Dual sample sets are collected for the purposes of conducting an IDSE under subpart U of 40 CFR, Part 141 and determining compliance with the TTHM and HAA5 MCLs under subpart V of 40 CFR, Part 141.

(45) "Effective corrosion inhibitor residual" for the purpose of compliance with Section 395-3-5.25, means a concentration sufficient to form a protective film on the interior walls of a pipe.

(46) "Enhanced coagulation" means the addition of sufficient coagulant for improved removal of disinfection byproduct precursors by conventional filtration treatment.

(47) "Enhanced softening" means the improved removal of disinfection byproduct precursors by precipitative softening.

(48) "Entry Point" means the sample point where after treatment drinking water enters the distribution system. For purposes of the Act and the Rules, "entry point" shall be defined as a sample location anywhere on the finished water line after treatment, up to and including the first service or customer tap.

(49) "EPA" means the United States Environmental Protection Agency.

(50) "Exemption" means approval from the Division affording a public water system, existing as of the effective date of these rules, an extended time for compliance with a maximum contaminant level or treatment technique contained in a drinking water standard. An exemption pertains to non-compliance with a maximum contaminant level for reasons other than that instance when application of a generally available treatment method fails to adequately treat the raw water source.

(51) "Federal Act" means the Federal Safe Drinking Water Act, 1974 P.L. 93-523, as amended.

(52) "Filter profile" means a graphical representation of individual filter performance, based on continuous turbidity measurements or total particle counts versus time for an entire filter run, from startup to backwash inclusively, that includes an assessment of filter performance while another filter is being backwashed.

(53) "Filtration" means a process for removing particulate matter from water by passage through porous media.

(54) "Finished water" is water that is introduced into the distribution system of a public water system and is intended for distribution and consumption without further treatment, except as treatment necessary to maintain water quality in the distribution system (*e.g.*, booster disinfection, addition of corrosion control chemicals).

(55) "First draw sample" means a one-liter sample of tap water collected in accordance with Section 391-3-5-.25, that has been standing in the plumbing pipes at least 6 hours and is collected without flushing the tap.

(56) "Flocculation" means a process to enhance agglomeration or collection of smaller floc particles into larger, more easily settleable particles by gentle stirring by hydraulic or mechanical means.

(57) "Flowing stream" is a course of running water flowing in a definite channel.

(58) "GAC10" means granular activated carbon filter beds with an empty-bed contact time of 10 minutes based on average daily flow and a carbon reactivation frequency of every 180 days, except that the reactivation frequency for GAC10 used as a best available technology for compliance with subpart V MCLs under 40 CFR § 141.64(b)(2) shall be 120 days.

(59) "GAC20" means granular activated carbon filter beds with an empty-bed contact time of 20 minutes based on average daily flow and a carbon reactivation frequency of every 240 days.

(60) "Gross alpha particle activity" means the total radioactivity due to alpha particle emission as inferred from measurements on a dry sample.

(61) "Gross beta particle activity" means the total radioactivity due to beta particle emission as inferred from measurement on a dry sample.

(62) "Ground water" means water obtained from wells and/or springs used as a source of water supply for a public water system.

(63) "Ground water under the direct influence of surface water" (GWUDI) means any water beneath the surface of the ground with:

(a) significant occurrence of insects or other microorganisms, algae, or large-diameter pathogens such as *Giardia lamblia*, or *Cryptosporidium*, or

(b) significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlate to climatological or surface water conditions.

(64) "Haloacetic acids (five)" (HAA5) mean the sum of the concentrations in milligrams per liter of the haloacetic acid compounds (monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid), rounded to two significant figures after addition.

(65) "Halogen" means one of the chemical elements chlorine, bromine or iodine.

(66) "Hazardous Material" means any chemical, substance or material that is classified as Hazardous by the U.S. Environmental Protection Agency (CFR 40, Part 261).

(67) "Health hazards" mean any conditions, devices, or practices in a water supply system or its operation, which create or may create an imminent and substantial danger to the health and wellbeing to the water consumer.

(68) "Heterotrophic plate count" formerly known as the standard plate count, is a procedure for estimating the number of live heterotrophic bacteria in water. Unless stated otherwise, heterotrophic plate count refers to Method 9215, the pour plate method, as set forth in *Standard Methods for the Examination of*

Water and Wastewater, American Public Health Association, 18th Edition, 1992, pp. 9-32 to 9-34, or subsequent edition.

(69) "Initial compliance period" means the first full three-year compliance period that begins January 1, 1993.

(70) "Inventory" for the purpose of Section 391-3-5-.40 means a written or computer database listing of all potential sources of ground-water pollution located within a wellhead protection area.

(71) "Lake/reservoir" refers to a natural or man-made basin or hollow on the Earth's surface in which water collects or is stored that may or may not have a current or single direction of flow.

(72) "Large water system" for the purpose of Section 391-3-5-.25 (Lead & Copper) means a water system that serves more than 50,000 persons.

(73) "Lead service line" means a line made of lead, which connects the discharge side of the water meter to the building inlet and any lead pigtail, gooseneck or other fitting, which is connected to such lead line.

(74) "*Legionella*" means a genus of bacteria, some species of which have caused a type of pneumonia called Legionnaires Disease.

(75) "Locational running annual average" (LRAA) is the average of sample analytical results for samples taken at a particular monitoring location during the previous four calendar quarters.

(76) "Man-made beta particle and photon emitters" means all radionuclides emitting beta particles and/or photons listed in Maximum Permissible Body Burdens and Maximum Permissible Concentration of Radionuclides in Air or Water for Occupational Exposure, NBS Handbook 69, except the daughter products of thorium-232, uranium-235 and uranium-238.

(77) "Maximum contaminant level" (MCL) means the highest level of a contaminant that is allowed in drinking water. MCLs are

set as close to the MCLGs as feasible using the best available treatment technology.

(78) "Maximum contaminant level goal" (MCLG) means the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

(79) "Maximum residual disinfectant level" (MRDL) means a level of a disinfectant added for water treatment that may not be exceeded at the consumer's tap without an unacceptable possibility of adverse health effects.

(80) "Maximum residual disinfectant level goal" (MRDLG) means the maximum level of a disinfectant added for water treatment at which no known or anticipated adverse effect on the health of persons would occur, and which allows an adequate margin of safety. MRDLGs are non-enforceable health goals and do not reflect the benefit of the addition of the chemical for control of waterborne microbial contamination.

(81) "Medium-size water system" for the purpose of Section 391-3-5-.25 (Lead & Copper), means a water system that serves greater than 3,300 and less than or equal to 50,000 persons.

(82) "Membrane filtration" is a pressure or vacuum driven separation process in which particulate matter larger than 1 micrometer is rejected by an engineered barrier, primarily through a size-exclusion mechanism, and which has a measurable removal efficiency of a target organism that can be verified through the application of a direct integrity test. This definition includes the common membrane technologies of microfiltration, ultrafiltration, nanofiltration, and reverse osmosis.

(83) "Minimum Community Population Determination" for the purpose of the Act and the Rules means the minimum residential population shall be determined by a mathematical calculation of the total number of active residential service connections, multiplied by Georgia's average population per household, as published in the most recent Federal Census Bureau Statistics. Multiple residential units served by a single connection (master meter) shall be included in the determination of population for a water system.

(84) "Near the first service connection" means at one of the 20 percent of all service connections in the entire system that are nearest the water supply treatment facility, as measured by water transport time within the distribution system.

(85) "Non-community water system" or "NCWS" means a public water system, which provides piped water for human consumption to at least 15 service connections or which serves at least 25 individuals at least 60 days out of the year but which is not a community water system. A non-community water system may be further classified as a "non-transient, non-community water system" or a "transient, non-community water system".

(86) "Non-transient, non-community water system" or "NTNCWS" means a public water system that is not a community water system and that regularly serves at least 25 of the same persons over 6 months per year.

(87) "Operator" means the person responsible for the maintenance and operation of the public water system. A certified operator is an operator registered as a Water Treatment Plant Operator in the State of Georgia in accordance with the provisions of the Certification of Water and Wastewater Treatment Plant Operators and Laboratory Analysts Act (Georgia Laws 1969, pp. 272 et. seq., as amended). For purposes of this Act a certified operator also includes persons involved with only the storage and distribution of drinking water.

(88) "Optimal corrosion control treatment" as it applies to Section 391-3-5.25 (Lead & Copper) of this Rule, means the corrosion control treatment that minimizes the lead and copper concentrations at user's taps while insuring that the treatment does not cause the water to violate any national primary drinking water regulation.

(89) "Person" means any individual, corporation, company, association, partnership, county, municipality, State agency, State authority, Federal agency, agency, facility, or other entity.

(90) "Picocurie" (pCi) means that quantity of radioactive material producing 2.22 nuclear transformations per minute.

(91) "Plant intake" refers to the works or structures at the head of a conduit through which water is diverted from a source (e.g., river or lake) into the treatment plant.

(92)"Point of disinfection application" is the point where the disinfectant is applied and water downstream of that point is not subject to recontamination by surface water runoff.

(93) "Presedimentation" is a preliminary treatment process used to remove gravel, sand and other particulate material from the source water through settling before the water enters the primary clarification and filtration processes in a treatment plant.

(94) "Professional Engineer" means a person registered to practice professional engineering in the State of Georgia in accordance with the provisions of the Act governing the Practice of Professional Engineering in Georgia. (Ga. Laws 1945, p. 294 et. seq., as amended).

(95) "Professional Geologist" means a person registered to practice professional geology in the State of Georgia in accordance with the provisions of the Registration of Geologist Act of 1975, (Code 1933, §84-2101a, enacted by the Georgia Legislature 1975, p.163, 1).

(96) "Public water system" or "PWS" means a system that provides water to the public for human consumption through pipes or other constructed conveyances, if such system has at least fifteen (15) service connections or regularly serves an average of twenty-five (25) individuals daily at least 60 days out of the year. Such terms include: 1) any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system; and 2) any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system. Such term does not include any "special irrigation district." A public water system is a "community water system", a "non-transient non-community water system" or a "transient non-community water system".

(97) "Raw water" means water from a source of water supply or a proposed source of water supply, which has not received any type of treatment to change the physical, chemical, biological, or radiological quality of the water.

(98) "Rem" means the unit of dose equivalent from ionizing radiation to the total body or any internal organ or organ system. A "millirem (mrem)" is 1/1000 of a rem.

(99) "Repeat compliance period" means any subsequent compliance period after the initial compliance period.

(100) "Repeat sample" means a sample that is collected and analyzed in response to a previous colliform-positive sample.

(101) "Residual disinfectant concentration" ("C" in CT calculations) means the concentration of disinfectant measured in milligrams per liter in a representative sample of water.

(102) "Sanitary survey" means an on-site review of the water source, facilities, equipment, treatment, operation and maintenance of a public water system for the purpose of evaluating the adequacy of each for producing and distributing safe drinking water.

(103) "Sedimentation" means a process for removal of solids before filtration by gravity or separation.

(104) "Service connection" means the point at which the water distribution main and the water service pipe, metered or unmetered, are connected to serve water to a residence or water customer. As used in the definition of PWS, "service connection" does not include a connection to a system that delivers water by a constructed conveyance other than a pipe if: (a) The water is used exclusively for purposes other than residential uses (consisting of drinking, bathing, and cooking, or other similar uses);

(b) The State determines that alternative water to achieve the equivalent level of public health protection provided by the applicable national primary drinking water regulation is provided for residential or similar uses for drinking and cooking; or

(c) The State determines that the water provided for residential or similar uses for drinking, cooking, and bathing is centrally treated or treated at the point of entry by the provider, a passthrough entity, or the user to achieve the equivalent level of protection provided by the applicable national primary drinking water regulations.

(105) "Service line sample" means a one-liter sample of water collected in accordance with Section 391-3-5-.25 that has been standing for at least 6 hours in the service line.

(106) "Single family structure" for the purpose of compliance with Section 391-3-5-.25 (Lead & Copper), means a building constructed as a single-family residence that is currently used as either a residence or place of business.

(107) "Slow sand filtration" means a process involving passage of raw water through a bed of sand at low velocity (generally less than 0.4 meters per hour) resulting in substantial particulate removal by physical and biological mechanisms.

(108) "Small water system" for the purpose of Section 391-3-5-.25 (Lead & Copper), means a water system that serves 3,300 persons or fewer.

(109) "Source of water supply" means the waters of the State from which raw water is taken into a public water system to be treated and/or distributed.

(110) "Source Water Assessment Plan" (SWAP) means a public report which documents a public drinking water system's and other stakeholders' reasonable efforts to ascertain the potential impact of natural or man-made pollutants, within a wellhead protection or watershed area, on the raw water source for the drinking water supply well or surface water intake.

(111) "Spring" means a source of water supply which naturally issues forth for the first time from rock or soil onto the land or into a body of water.

(112) "Standard sample" means the aliquot of finished drinking water that is examined for the presence of coliform bacteria.

(113) "Storage tank" or "Tank" means any covered structure, such as clearwell, standpipe, reservoir, elevated tank, hydropneumatic tank or other storage facility or combination thereof used to store drinking water.

(114) "Subpart H systems" means public water systems using surface water or ground water under the direct influence of surface water as a source.

(115) "Supplier of water" or "Supplier" means any person who owns or operates a public water system.

(116) "Surface water" means and includes any and all rivers, streams, branches, creeks, ponds, tributary streams, drainage basins, natural lakes, artificial reservoirs and impoundments and ground water under the direct influence of surface water.

(117) "SUVA" means Specific Ultraviolet Absorption at 254 nanometers (nm), an indicator of the humic content of water. It is a calculated parameter obtained by dividing a sample's ultraviolet absorption at a wavelength of 254 nm by its concentration of dissolved organic carbon (DOC) (in mg/L).

(118) "System with a single service connection" means a system, which supplies drinking water to consumers via a single service line.

(119) "Total Organic Carbon" (TOC) means total organic carbon in mg/L measured using heat, oxygen, ultraviolet irradiation, chemical oxidants, or combinations of these oxidants that convert organic carbon to carbon dioxide, rounded to two significant figures.

(120) "Total trihalomethanes" (TTHM) means the sum of the concentration in milligrams per liter of the trihalomethane compounds: trichloromethane (chloroform), dibromochloromethane, bromodichloromethane and tribromomethane (bromoform), rounded to two significant figures.

(121) "Too numerous to count" means that the total number of bacterial colonies exceed 200 on a 47-mm diameter membrane filter used for coliform detection.

(122) "Transient non-community water system" or "TNCWS" means a public water system that is not a community water system or a non-transient non-community water system. A transient non-community water system provides piped water for human consumption to at least 15 service connections or which regularly serves at least 25 persons at least 60 days a year.

(123) "Treatment Technique" means a required process intended to reduce the level of contaminants in drinking water.

(124) "Treatment technique requirement" means a requirement, which specifies for a contaminant, a specific treatment technique(s), which leads to a reduction in the level of such contaminant sufficient to comply with the requirements of these Rules.

(125) "Trihalomethane" (THM) means one of the family of organic compounds, named as derivatives of methane, wherein three of the four hydrogen atoms in methane are each substituted by a halogen atom in the molecular structure.

(126) "Two-stage lime softening" is a process in which chemical addition and hardness precipitation occur in each of two distinct unit clarification processes in series prior to filtration.

(127) "Unconfined aquifer" means an aquifer which is not separated from the land surface by a significant zone of low permeability and, therefore, is more susceptible to pollution from the activities of mankind. Wellhead Protection Areas for unconfined aquifers are larger than such areas for confined aquifers.

(128) "Uncovered finished water storage facility" means a tank, reservoir or other facility used to store water that will undergo no further treatment except residual disinfection and is open to the atmosphere.

(129) "Variance" means approval from the Division affording a public water system an extended time for compliance with a maximum contaminant level or treatment technique contained in a drinking water standard. A variance pertains to non-compliance with a maximum contaminant level due to the inability to meet the maximum contaminant level even when a treatment method has been applied to a raw water source. The noncompliance is due to the quality of the raw water.

(130) "Virus" means a microorganism of fecal origin, which is infectious to humans by waterborne transmission.

(131) "Waterborne disease outbreak" means the significant occurrence of acute infectious illness, epidemiologically associated with the ingestion of water from a public water system which is deficient in treatment, as determined by the Division.

(132) "Waters" or "Waters of the State" means and includes any and all rivers, streams, creeks, branches, lakes, reservoirs, ponds, drainage systems, springs, wells, and all other bodies of surface or underground water, natural or artificial, of this State.

(133) "Watershed Area" means the entire drainage basin upstream of a water intake located on a stream or lake.

(134) "Well" means any excavation that is cored, bored, drilled, jetted, dug, or otherwise constructed for the purpose of locating, testing, or withdrawing ground water.

(135) "Wellhead protection area" means an area of potential ground water recharge around a well which should be protected from surface and subsurface sources of manmade pollution in

order to protect the quality of drinking water supplies.

(136) "Wholesale system" is a public water system that treats source water as necessary to produce finished water and then delivers some or all of that finished water to another public water system. Delivery may be through a direct connection or through the distribution system of one or more consecutive systems.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Designation of Department as Proper Authority to Administer and Enforce Rules" adopted. F. Sept. 6, 1973; eff. Sept. 26, 1973. **Repealed:** New Rule entitled "Definitions" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Amended:** F. July 15, 1983; eff. Aug. 4, 1983. **Amended:** F. May 12, 1989; eff. June 1, 1989. **Amended:** F. Dec. 4, 1990; eff. Dec. 24, 1990. **Repealed:** New Rule same title adopted. F. June 7, 1993; eff. June 27, 1993. **Repealed:** New Rule, same title, adopted. F. June 7, 1993; eff. Mar. 30, 1994. **Amended F**. Sept. 26, 1997; eff. Oct. 16, 1997. **Amended:** F. Sept. 24, 1999; eff. Oct. 14, 1999. **Amended:** F. Sept. 29, 2000; eff. Oct. 19, 2000. **Amended:** F. Dec. 10, 2002; eff. Dec. 30, 2002. **Amended:** F. Dec. 21, 2004; eff. Jan. 10, 2005. **Amended:** F. May 27, 2009; eff. June 16, 2009. **Amended:** New title "Definitions. Amended." F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.03 Coverage. Amended.

(1) **Applicability.** These rules shall apply to all public water systems in the state, except that such rules shall not apply to a public water system which meets all the following criteria:

(a) which consists only of distribution and storage facilities (and does not have any collection and treatment facilities);

(b) which obtains all of its water from, but is not owned or operated by the owner or operator of a public water system to which such rules apply;

(c) which does not sell water to any person; and

(d) which is not a carrier which conveys passengers in interstate commerce.

Authority Ga. L. 1977, p. 351 *et seq.*, O.C.G.A. Sec. 12-5-170 *et seq.*, as amended. **History.** Original Rule entitled "Approved Required" was filed on September 6, 1973; effective September 26, 1973. **Amended:** Rule repealed and a new Rule entitled "Coverage" adopted. Filed July 5, 1977; effective July 26, 1977, as specified by Rule 391-3-5-.47. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.04 Approval Required. Amended.

(1) **Approval.** No person shall erect, construct, or operate a public water system, nor undertake substantial enlargements, extensions, additions, modifications, renovations or repairs to any public water system, including storage, distribution, purification, or treatment components, without having first secured the Division's approval of: the source of water supply; the means and methods of treating, purifying, storing and distributing said water; and obtaining a permit to operate a public water system, except as provided by paragraph (2) of this Section. The approval of the Director must be obtained prior to the dividing of a public water system. For purposes of these rules "substantial" as used in this Section shall not include routine maintenance.

(2) **Limited Additions.** Governmentally owned public water systems and water authorities with qualified staff and meeting operating criteria developed by the Division may, with prior approval from the Division, approve limited additions to the water system. These additions will be limited to water distribution lines to serve subdivisions, apartment complexes and shopping centers. The review of other additional types of water distribution system additions and/or extensions may be delegated to those local governments that have demonstrated the capability for such reviews. All delegations shall be by written agreement. Additions approved by the water system must be reported annually in a format prescribed by the Division.

(3) **Local Governmental Approval.** Before a person may initiate construction of a new public water system or increase the capacity of an existing public water system, the person shall notify the local government in which the system is located and obtain the local government's approval for development of the project within its jurisdiction, prior to the submittal of the plans and specifications to the Division for approval. To the extent practicable, the person should avoid locating part or all of the new or expanded facility at

a site which:

(a) is subject to a significant risk from earthquakes, floods, fires or other disasters which could cause a breakdown of the public water system or a portion thereof; or

(b) except for intake structures, is within the floodplain of a 100year flood or is lower than any recorded high tide where appropriate records exist; or

(c) is on or in close proximity to an abandoned landfill or any other site used for waste disposal.

(4) Trust Indenture. The requirements of this paragraph shall apply to all non-governmentally owned community public water systems that have been issued a permit to operate by the Director or have applied for a permit before January 1, 1998. To assure the continuity of operation and maintenance of a non-governmentally owned and operated public water system when the water customers own the property being served by the supplier, the supplier of the water system shall file with the Division an executed Trust Indenture as prescribed by the Division and approved by the Director. The Trustee should preferably be a governmental authority. When a governmental authority is not available, the Trustee should be a property owners association organized to guarantee the operation and maintenance of the public water system. The association must be made up of members who are owners of properties served by the water system. The Articles of Incorporation and By-Laws of the association are to be submitted to the Division for review and/or approval. If a Trustee other than a unit of local government or property owners association is proposed, it will be necessary to determine that there is no identityof-interest between the owner or the system and the Trustee. For new or proposed systems, the legal documents shall be submitted with the plans and specifications. When the supplier is or desires to serve water to property not individually owned by the water consumer, a legal document assuring the continuity and maintenance of operation may not be required.

(5) **Connect to Local Governmental Public Water System.** Any person who desires to own or operate or who desires to commence the operation of a public water system shall first evaluate connecting to an existing local governmentally owned and operated public water system.

(6) **Approval for No Connection to Local Governmental Public Water System.** No approval of the plans and specifications for the development of a separate source of water supply or the construction of the water system will be made and no permit to operate will be issued until the owner has provided acceptable certification to the Division outlining the reasons why the system cannot connect to an existing local governmentally owned water system.

(7) **Pre-Operating Compliance Conditions.** Beginning January 1, 1998, the Division shall require compliance with the following conditions prior to the issuance of the initial permit to operate to a new privately owned community public water system:

(a) The owner shall provide written certification from the local government in which the system is located, that the local government is in concurrence with the development of the privately owned public water system. The certification shall be provided to the Division with the submission of the permit application and prior to or concurrently with the submission to the Division of the plans and specifications for construction of the proposed public water system.

(b) The owner must retain a Professional Engineer, registered in the State of Georgia, to prepare plans and specifications for approval by the Division for the construction of the proposed public water system, and the owner shall submit to the Division a certification from the engineer that the water system was constructed according to the plans and specifications approved by the Division. The public water system must be designed and constructed in accordance with the Division's "Minimum Standards for Public Water Systems", latest edition. (c) The owner must submit to the Division for approval, a multiyear business plan which adequately demonstrates the water system's managerial and financial capacity to comply with all drinking water regulations in effect, or likely to be in effect. The business plan shall be prepared in accordance with the Division's "Minimum Standards for Public Water Systems", latest edition. The business plan shall be updated at intervals determined by the Director.

(d) The owner must provide an approved back-up water source, such as an additional well, capable of providing adequate water service if the primary source becomes nonfunctional. The requirement for an approved back-up water source may be waived by the Director for systems with less than 25 service connections.

(e) The owner must submit a recorded copy of a trust indenture or other legal agreement approved by the Division that has been executed with the local government in which the system is located, which assures the operation and maintenance of the public water system in compliance with the drinking water regulations established pursuant to the Act. If the local government is not available or agreeable to be the Trustee for a proposed privately owned community public water system, written documentation from the local government certifying it has no desire to act in this capacity shall be provided to the Division. When the local government is not available or agreeable to be the Trustee, the owner shall obtain a Trustee acceptable to the Division and execute a trust indenture or other legal agreement approved by the Division. If a Trustee other than a local government or a property owners association is proposed, it will be necessary for the owner and the Trustee to certify in writing to the Division that there is no identity-of-interest between the owner of the system and the Trustee. For new or proposed community water systems, the recorded copies of the legal documents shall be submitted with the plans and specifications.

(8) **Treatment Products and Materials.** Products added directly to drinking water for its treatment or introduced indirectly into

drinking water through its contact with surfaces of materials or products used for its treatment, storage, transmission, or distribution shall not adversely affect drinking water quality and public health.

(a) All treatment chemicals that come into contact with drinking water shall be certified for conformance with American National Standards Institute/National Sanitation Foundation Standard 60 (ANSI/NSF Standard 60) by an American National Standards Institute (ANSI) approved third-party certification program or laboratory.

(b) All products that come into contact with drinking water during its treatment, storage, transmission or distribution shall be certified for conformance with American National Standards Institute/ National Sanitation Foundation Standard 61 (ANSI/NSF Standard 61) by an American National Standards Institute (ANSI) approved third-party certification program or laboratory.

(9) **Infrastructure Security.** Public water systems must provide appropriate measures to protect and secure its critical drinking water supply infrastructure, including its water source, treatment, distribution, and any other component that is deemed pertinent to the safe operation and maintenance of the drinking water supply system.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History**. Original Rule entitled "General Provisions" adopted. F. Sept. 6, 1973; eff. Sept. 26, 1973. **Repealed**: New Rule entitled "Approval Required" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Amended**: F. July 15, 1983; eff. Aug. 4, 1983. **Repealed**: New Rule, same title adopted. F. May 12, 1989; eff. June 1, 1989. **Amended**: F. June 25, 1992; eff. July 15, 1992. **Amended**: F. Sept. 26, 1997; eff. Oct. 16, 1997. **Amended**: F. Sept. 24, 1999; eff. Oct. 14, 1999. **Amended**: F. Sept. 29, 2000; eff. Oct. 19, 2000. **Amended**: F. June 8, 2001; eff. June 28, 2001. **Amended**: Dec. 10, 2002; eff. Dec. 30, 2002. **Amended**: F. Dec. 21, 2004; eff. Jan. 10, 2005. **Amended**: New title "Approval Required. Amended" F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.05 Preparation and Submission of Engineering Reports, Plans and Specifications for Public Water Systems. Amended.

(1) **General Provisions**. For any activity listed in paragraph (1) of Section 391-3-5-.04 an engineering report prepared by a professional engineer shall be submitted to the Division prior to the preparation of the final construction plans and specifications. Plans and Specifications shall be prepared by a professional engineer and submitted to the Division, accompanied by a letter of submittal identifying the project, owner and owner's address. No construction shall be initiated without prior approval from the Division. The engineering report and/or plans and specifications may be waived by the Director when information submitted by the supplier of water allows an engineering appraisal of the proposed activity to be made by the Division as follows:

(a) For minor extensions, additions and/or modification to an existing governmentally owned public water systems which do not affect the normal operation of said water system.

(b) For new public water systems which are classified as transient non-community water systems and for additions to existing transient non-community water systems.

(2) **Engineering Report.** The Engineering report shall contain a comprehensive description of the proposed activity including, but not limited to the following:

(a) scope and description of proposed activity;

(b) description of the proposed source of water supply, and data concerning the quality of the water;

(c) pertinent information regarding present available sources of water supply, water treatment facilities, and existing public water systems;

(d) sufficient maps, diagrams, charts, tables, calculations, basis of

design data and graphs to make the reports readily understandable; all sheets shall be descriptively labeled and bound together or folded in a folder attached to the report;

(e) operational and maintenance program description;

(f) the known character and depth of the natural earth formations through and from which groundwater sources are to developed;

(g) factors which may affect the quality of a source of water supply as determined by a survey of the water shed above the surface water intake or the surrounding area of a groundwater source.

(3) **Minimum Standards.** Beginning January 1, 1998, all new, additions, or extensions to public water systems shall be designed and constructed in accordance with the latest edition of the Division's "Minimum Standards for Public Water Systems".

(4) **Plans and Specifications.** Plans and specifications must be submitted with additional copies as may be requested, and shall include, but not be limited to the following:

(a) map plans of the area to be served by the public water system, including, but not limited to: geographical location of the project, location of all existing and proposed streets in the area to be served, location of the source of water supply and the treatment facilities, and elevations of the principal parts of the public water system;

(b) detailed plans of the location and the construction of the storage tank, water mains, valves, fire hydrants and appurtenances;

(c) detailed plans of: the location and construction of the water treatment facilities including layout and relationship of the various units of the treatment facility; general piping, pumps, reservoirs, flow measuring devices, controls, points of chemical application, water sampling points, plant control laboratory, chemical feed equipment and chemical storage area. Sufficient dimensions and elevations shall be provided to make all parts of the readily understandable. (d) the dimensions of the plan sheets must be within the following limits: twenty (20) to thirty (30) inches in height and twenty-four (24) to forty-two (42) inches in length, and shall be of sufficient clarity to be microfilmed;

(e) each plan sheet shall have printed thereon the name and location of the public water system, name and registration stamp of the professional engineer, scale, true and magnetic north, and shall be bound together and numbered consecutively;

(f) if the plans are solely for extensions to an existing public water system, only such information as is necessary for comprehension of the plans and construction of the project will be required;

(g) specifications will be separate from the plans and shall have printed thereon the name and location of the public water system, name and stamp of the professional engineer, and shall be bound together and numbered consecutively;

(h) specifications for the construction of the public water system shall accompany all plans for new or existing public water systems and shall describe the plans for the whole and for each unit or component of construction of the proposed public water system, including where necessary, testing and disinfection, painting, laboratory equipment, metering and recording devices and related material;

(i) the specifications may be omitted for extensions or additions to existing systems provided the proposed construction is in accordance with specifications previously approved and on file with the Division;

(j) manufacturers' brochures of specifications of materials are not acceptable for purposes of this requirement.

(5) **Deviations from Approved Plans.** Any significant deviation from the approved plans or specification must receive prior approval by the Division.

(6) Installation According to Plans and Specifications. Upon

completion of the installation of the public water system or any modification, the owner must send to the Division a statement from the engineer who prepared the plans and specifications that the system, as installed, is in accordance with the approved plans and specifications.

(7) **Integrity of Treatment Units or Equipment.** Approval of plans and specifications by the Division does not include approval of the structural, electrical, mechanical, or design integrity of the treatment units or equipment.

(8) **Construction Without Division Approval.** At the discretion of the Director, an existing public water system that is constructed without obtaining prior approval from the Division may be considered acceptable by the Director, provided all of the following are accomplished to the satisfaction of the Division:

(a) An engineering evaluation of the constructed facilities is made by a professional engineer, licensed in the state of Georgia, to evaluate and certify conformance of the constructed facilities with all of the applicable sections of the rules in this Chapter. The engineer's certification, along with the "as-built" plans and specifications must be submitted to the Division for review and comment.

(b) All items, data, documentation and information required for source approvals and permit issuances for a public water system, as stated in the rules of this Chapter, must be submitted to the Division. Any additional and/or corrective action that is required by the Division for the owner or operator of the system to complete, prior to issuance of the permit, must be accomplished within ninety (90) days from the date of notification by the Division.

Authority Ga. L. 1977, p. 351, *et seq.*, O.C.G.A. Sec. 12-5-170 *et seq.*, as amended. **History.** Original Rule entitled "Source of Water Supply" was filed on September 6, 1973; effective September 26, 1973. **Amended:** Rule repealed and a new Rule entitled "Preparations and Submission of Engineering Report, Plans and

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Specifications for Public Water System" adopted. Filed July 5, 1977; effective July 26 1977, as specified by Rule 391-3-5-.47. **Amended:** F. Sept. 26, 1997; eff. Oct. 16, 1997. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.06 Source of Water Supply. Amended.

(1) **Source of Water Supply.** The source of water supply for all public water systems must have the approval of the Division and a valid ground water (Ground Water Use Act of 1972, as amended) or surface water (Georgia Water Quality Control Act of 1977, as amended) withdrawal permit where applicable. Beginning January 1, 1998, all owners and operators of new community public water systems with groundwater sources must provide an approved back-up water supply source, capable of providing adequate water service, if the primary source becomes nonfunctional. The Director may waive this requirement for systems with less than 25 service connections. Beginning December 1, 2009, any new ground water source must provide treatment that reliably achieves at least 4-log (99.99%) treatment of viruses before or at the first customer.

(a) All sources of water supply must be adequate as determined by the Division to meet anticipated growth. For human consumption in a community water system, one hundred (100) gallons per day for the projected population to be served at the end of the design period shall be considered adequate.

1. Beginning January 1, 1998, all new sources constructed for water supply systems, that are required to comply with the rules in this Chapter, shall be metered.

2. Beginning January 1, 1999, permitted water systems shall meter their existing water supply sources, when required by the Division or when the system's existing permit to operate a public water system is renewed or modified.

(b) The water must be of such quality that with reasonable treatment it will meet the Safe Drinking Water Rules of this Chapter.

(c) Before approval of a surface water source the following procedures and requirements must be met:

1. Raw water samples from the proposed source shall be collected

by the supplier or designee and submitted to a certified laboratory for microbiological analysis for the period of time and frequency specified by the Division.

2. The supplier shall have the water from the proposed source analyzed for the physical, chemical and radiological parameters specified by the Division in a laboratory acceptable to the Division and shall furnish a copy of the results of the analysis to the Division.

3. For an impoundment source, allowance must be made for water losses including required releases, evaporation, seepage and siltation. Available stream flow and weather records must be used in estimating the yield of the source.

4. Bathing, water skiing, boating, fishing, or other activities in or upon any natural lake, artificial reservoir or impoundment used as a source of water supply must be prohibited, unless evidence is presented to the Division that the drinking water quality will not be adversely affected by these activities and prior written approval for such activity is obtained from the Division.

5. A Source Water Assessment Plan (SWAP) for the proposed surface water source intake must be developed in accordance with the Division's *Source Water Assessment and Protection Implementation Plan for Public Drinking Water Sources*, as outlined in Section 391-3-5-.42 of this Chapter.

(d) Before approval of a ground water source, whether from a well or a spring, the following procedures and requirements must be met:

1. Raw water samples of the proposed source shall be collected by the supplier and submitted to a laboratory certified by the Division for microbiological analysis for a period of time and frequency specified by the Division.

2. The supplier shall, when directed by the Division, have the water from the proposed source analyzed for the physical, chemical and radiological parameters specified by the Division in a laboratory acceptable to the Division and shall furnish a copy of

the results of the analysis to the Division.

3. Any drilled well previously used as a source of public water supply but inactive for three or more years and proposed to be reactivated as a source of supply shall be test pumped and meet the requirements of subparagraphs 1. and 2. of this paragraph.

4. A Source Water Assessment Plan (SWAP) for the proposed ground water source must be developed, as applicable, in accordance with the Division's *Source Water Assessment and Protection Implementation Plan for Public Drinking Water Sources*, as outlined in Section 391-3-5-.42 of this Chapter.

(e) The Division may direct that a ground water source be evaluated for the influence of surface water. Within eighteen (18) months of Division notification that a ground water source is under the direct influence of surface water, the supplier shall install filtration treatment and may be required by the Division to install additional treatment in accordance with subparagraph (a) of Rule 391-3-5-.09.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Engineering Report" adopted. F. Sept. 6, 1973; eff. Sept. 26, 1973. **Repealed:** New Rule entitled "Source of Water Supply" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by R. 391-3-5-.47. **Amended:** F. July 15, 1983; eff. Aug. 4, 1983. **Amended:** F. May 12, 1989; eff. June 1, 1989. **Amended:** F. Dec. 4, 1990; eff. Dec. 24, 1990. **Amended:** F. Mar. 10, 1994; eff. Mar. 30, 1994. **Amended:** F. Sept. 26, 1997; eff. Oct. 16, 1997. **Amended:** F. Dec. 10, 2002; eff. Dec. 30, 2002. **Amended:** F. May 27, 2009; eff. June 16, 2009. **Amended:** New title "Source of Water Supply. Amended." F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.07 Wells. Amended.

(1) **Approval.** No person shall construct a well as a source of water supply for a public water system without having first obtained approval from the Division. This requirement may be waived by the Director during emergency situations. Any well that is constructed and does not meet the rules of this Chapter shall not later be used as a drinking water source for a public water system.

(2) **Prohibited Wells.** Dug, bored, or jetted wells are prohibited for all new public water systems.

(3) **Protection from Contamination.** Each well must be protected from contamination by surface waters and other sources of contamination. The location of wells must be in compliance with the following criteria:

(a) generally at the highest point, and as far removed, and in a direction opposite to the ground water flow from any known or probable source of contamination as the general layout of the premises and surroundings will permit;

(b) not less than fifty (50) feet from a septic tank;

(c) not less than one hundred (100) feet away from a septic tank absorption field;

(d) not less than ten (10) feet away from a sewer;

(e) not less than one thousand (1,000) feet away from a solid waste disposal site and not in a direction where ground water flow from the site may be intercepted by the well;

(f) as far removed as possible from all open abandoned wells;

(g) in areas of sink holes, a survey may be required by the Division to determine the most suitable well location if there is insufficient information available to make such determination.

(h) no well shall be located in the flood plain unless adequate protection is provided to prevent submergence of the well casing,

pumps and appurtenances;

(i) variation of the distance from areas of known or probable sources of contamination may be permitted or required by the Division due to topography, local soil or geologic conditions.

(4) **Fill, Plug and Seal.** Whenever a bore hole of any depth is excavated for, but not used as a source of water supply it shall be the supplier's responsibility to fill, plug and seal the hole within thirty (30) days of the excavation in a manner approved by the Division to restore as nearly as possible the natural earth condition existing before the hole was excavated and to protect against contamination of the ground water. This paragraph shall not apply where some other use is made of the ground water from the well hole.

(5) Well Construction Standards. All wells must be constructed as hereinafter provided, however, deviations from these rules may be permitted or required by the Division due to the variable conditions of the subsurface and ground water quality in a specific area.

(a) Drilling fluids must be from an uncontaminated source or must be disinfected.

(b) All permanent casing, liners, screens and other manufactured material used in the well installation must be new and adequate to protect the well against entrance of contaminants during the expected life of the well. All casing and liner pipe joints shall be water tight the entire length in drilled wells.

1. Steel pipe well casing shall conform to American Society for Testing and Materials (ASTM) Specification A 120 or A 53 American Petroleum Institute (API) Specification 5L or 5LS or equal standard and meet the following minimum wall thickness unless otherwise approved by the Division.

Nominal Casing Diameter	Minimum Wall
(inches)	Thickness (inches)
4	0.188
5	0.188
6	0.188
8	0.219
10	0.250
12	0.250
14	0.312
16	0.312
18	0.375
20	0.375
24	0.375

2. The use of plastic well casing and screens must be approved by the Division prior to well installation. The well casing and couplings shall meet the requirements of the ASTM Standard F 480 or equal standard and the National Sanitation Foundation for use with potable water. When approved for use by Division, plastic well casing shall conform to the following minimum wall thickness unless otherwise approved by the Division.

Nominal Casing Diameter (inches)	Minimum Wall Thickness (inches)
4	0.265
4.5	0.291
6	0.390
8	0.508
10	0.632
12	0.750

Plastic well casing and screen shall not extend to a depth of greater than 300 feet below the ground surface.

(c) The outer, permanent, protective casing shall extend at least five (5) feet into the first solid, unweathered or impervious subsurface rock strata encountered, and shall have a minimum length of twenty-five (25) feet from the ground surface into a well excavated into water-bearing formations in crystalline rocks and fifty (50) feet in a well excavated into sedimentary water-bearing formations. The outer, permanent, protective casing shall be cement grouted its entire length with a cement slurry consisting of not more than six (6) gallons of water to one cubic foot cement, plus standard additives, when necessary, to facilitate placing or setting and shall be placed under pressure from the bottom of the annular space to be grouted upward until the grout is extruded at the earth's surface. The wall thickness of the cement grout surrounding the outer, permanent, protective casing shall be not less than one and one-half (1-1/2) inches at any point. Subsurface well construction shall cease for at least twenty-four (24) hours after grouting. Other grouting materials for sealing the annular space may be used upon the approval of the Division prior to well construction.

(d) Any ground water of unacceptable quality encountered during the well construction must be sealed off.

(e) The gravel for gravel-packed wells must be washed, free of organic matter, and composed of well rounded particles.

(6) **Stoppage During Construction.** During the periods of stoppage of the well construction and when the site is unattended, the drilling contractor must have the well opening securely covered to prevent tampering and possible contamination.

(7) **Sanitary Conditions.** During the well construction, the premises, construction material, tools and equipment must be maintained in a sanitary manner to prevent contamination of the well by the person excavating the well.

(8) **Proper Well Development.** Every well must be properly developed, disinfected, and pump tested by the drilling contractor. The well must be test pumped at not less than the desired yield for

a period of at least twenty-four (24) hours and shall continue for at least four (4) hours after the pumping level has stabilized. The static water level, drawdown and pumping water level must be measured.

(9) **Disinfection of the Well**.

(a) The well must be disinfected prior to the pumping test by the introduction of a chlorine solution into the well under sufficient pressure to overcome the natural flow pressures of all developed water-bearing zones, and in sufficient quantity to produce a minimum chlorine residual of fifty (50) parts per million in six (6) hours after such application.

(b) After disinfection, the well must be pumped until no trace of chlorine remains in the water, and water samples taken for microbiological analysis. No water may be furnished for human consumption until samples of water are collected by the supplier, and submitted to the Division for microbiological examination, and the quality of the water approved by the Division. If the water samples submitted are found to be unsatisfactory, the disinfection procedure must be repeated as required by the Division.

(c) The permanent pump and pumping equipment shall be disinfected with a chlorine solution prior to being placed into service.

(10) **Licensed Water Well Contractor.** The person constructing the well shall be a licensed water well contractor in the State of Georgia in accordance with the provisions of the Water Well Standards Act of 1985 (O.C.G.A. § 12-5-120, et. seq.). The contractor must maintain accurate driller logs, material setting and grouting data, complete results of the pump test, including water level measurements, and must furnish a signed copy of the results to the owner and to the Division on forms provided by the Division.

(11) **Installation Standards.** A well used as a source of water supply must include the following:

(a) A concrete slab with a minimum thickness of six (6) inches shall be constructed around the well casing and shall extend at least two (2) feet in all directions, and slope away, from the casing.

(b) The well casing shall extend at least twelve (12) inches above the concrete slab of the floor.

(c) For submersible pump installations, the well casing shall be provided with a sealed cover plate and, when required by the Division, vented by a screened riser pipe so that the screened opening terminated downward at least twelve (12) inches above the top of the casing or ground level.

(d) For turbine pump installations, a concrete block to support the pump motor shall be constructed around the outer well casing and shall extend at least twelve (12) inches above the concrete slab, and:

1. the outer casing shall extend at least one (1) inch above the pump motor block;

2. the well head and pump base shall be sealed to prevent seepage and the casing shall be vented by a screened riser pipe so that the screen opening terminates downward and above any point of back flow of contaminants into the well; and

3. oil lubricated vertical turbine pumps shall be lubricated with an acceptable turbine oil as prescribed by the pump manufacturer.

(e) A raw water sampling tap shall be provided on the well discharge pipe.

(f) An access port of not less than five-eights (5/8) inch in diameter, with screw cap, for water level measurements; a deep well air line and gage may also be used in conjunction with the access port.

(12) **Deepening Existing Wells.** Existing wells that are deepened shall be regarded by the Division as a development of a new ground water source and must meet the requirements for approval.

(13) Rehabilitating Existing Wells. When an existing well is

rehabilitated or reworked, the well shall be disinfected according to procedures described in this Section.

(14) **Infrastructure Security.** The pumping and water treatment equipment shall be protected from unauthorized entry and use by an enclosed shelter or enclosed by a fence. In addition, the water treatment equipment shall be enclosed in a weather-proof shelter.

Authority Ga. L. 1977, p. 351, *et seq.*, O.C.G.A. Sec. 12-5-170 *et seq.*, as amended. **History.** Original Rule entitled "General Plan Map Requirements" was filed on September 6, 1973; effective September 26, 1973. **Amended:** Rule repealed and a new Rule entitled "Wells" adopted. Filed July 5, 1977; effective July 26, 1977, as specified by Rule 391-3-5-.47. **Amended:** Filed July 15, 1983; effective August 4, 1983; **Amended:** F. May 12, 1989; eff. Jun. 1, 1989. **Amended:** F. Sept. 26, 1997; eff. Oct 16, 1997. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.08 Springs. Amended.

(1) **Enclosure Required.** A spring to be used as a source of water supply for a public water system must be protected by an enclosed structure. The walls of the structure must extend down to bedrock, or into the soil sufficiently to provide for a proper foundation to prevent surface water infiltration.

(2) **Runoff Diversion.** All surface water runoff must be diverted from the spring.

(3) **Surface Water Entry.** The spring must be protected from any entry of surface water.

(4) **Overflow.** The overflow from the spring's enclosed structure must be designed to prevent entrance of contaminants or animals.

(5) **Facility Enclosure.** The pumping and water treatment facilities must be enclosed in shelters that are of weather and vandal-proof construction.

(6) **Infrastructure Security.** The spring area must be secured as specified by the Division to prevent unauthorized entry.

Authority Ga. L. 1977, p. 351, *et seq.*, O.C.G.A. Sec. 12-5-170 *et seq.*, as amended. **History.** Original Rule entitled "Plans and Specifications" was filed on September 6, 1973; effective September 26, 1973; **Amended:** Rule repealed and a new Rule entitled "Springs" adopted. Filed July 5, 1977; effective July 26, 1977, as specified by Rule 391-5-.47. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.09 Water Treatment Facilities. Amended.

(1) **Water Treatment Facility Requirements.** All means and methods of treating, purifying and storing water for public water systems must be approved by the Division. The Division shall consider, but not be limited to, the following requirements when evaluating water treatment facilities for a public water system:

(a) Surface water treatment plants and ground water treatment plants must be of such design and capacity to provide for the required treatment of the raw water so that the drinking water will comply with the rules of this Chapter. In addition, surface water treatment plants and plants treating ground water under the influence of surface water must provide facilities for filtration of the raw water, and must provide, when required by the Division, flocculation and sedimentation of the raw water and continuous coagulation or application of other filter aids for optimization of filter performance.

1. Water treatment plants processing surface water sources shall include, but not be limited to, means for rapid mixing, flocculation, sedimentation, filtration and disinfection. The treatment plant shall be of such construction to allow units to be taken out of service without disrupting operation and required treatment processes.

2. Based upon the quality of raw water, the quality desired in the finished water and other factors, multiple-stage treatment facilities and/or presedimentation facilities, shall be provided when required by the Division.

(b) The Division may accept new and alternate treatment means, methods and technologies, provided the following are demonstrated to the satisfaction of the Division:

1. the treatment method has been thoroughly tested in full scale comparable installations by an acceptable third party, in accordance with protocol and standards acceptable to the Division.

2. has been thoroughly tested in a pilot plant approved by the

Division, by an acceptable third party, in accordance with protocol and standards acceptable to the Division, and operated for a period that will demonstrate the effectiveness and reliability of the proposed treatment system during changes in seasonal, and climatic conditions.

3. compliance with the treatment technique requirements of paragraph (p) of this section.

(c) Water from a spring shall be disinfected and retained in a detention tank for a minimum of thirty (30) minutes unless otherwise approved by the Division; and such additional water treatment as the Division may require for the drinking water to comply with the rules of this Chapter.

(d) Chemical feed equipment shall be of such design and capacity to accurately supply, at all times, the treatment chemicals required.

(e) Chlorination equipment may be solution-feed-gas-type but must have sufficient feed capacity for the treatment of the raw water and drinking water to maintain a chlorine residual in the drinking water as required by paragraph (2) of Section 391-3-5-.14.

(f) Gas chlorination equipment and cylinders must be housed in a separate room or facility provided for that purpose, separated from the other treatment facilities and chemicals. The following shall be required:

1. Chlorine cylinders stored or used outdoors must be protected from the direct rays of the sun by shading and additionally protected to prevent unauthorized tampering.

2. Chlorine cylinders must be secured from accidental tipping or movement.

3. A chlorine gas mask or self-contained gas mask (air pack) must be provided outside the gas chlorine room or facility or otherwise made available and be readily accessible to the operator for repairs or emergencies. 4. Forced air ventilation, placed near floor level and near the cylinders, must be provided to exhaust any leaking chlorine gas from a confined room or facility. Exhaust fumes must be directed away from the entrance to the room or facility. The fan must be activated by an outside switch or start automatically when the door is opened.

5. A small bottle of fresh ammonia solution shall be provided for testing for chlorine gas leaks.

(g) Hypochlorite feeders are not required to be placed in a separate room or facility.

(h) Other means of disinfection such as iodine, ultra-violet light, or ozone treatment may be approved by the Division.

(i) There must be sufficient space for chemical storage.

(j) Fluoridation equipment and chemicals, where used, must be placed in a separate room or facility provided for that purpose, unless otherwise approved by the Division.

(k) Each water treatment facility must have, as may be required by the Division, a laboratory and laboratory equipment to perform daily tests pertinent to the proper control of the required water treatment operations.

(1) Water sampling taps shall be placed in the water treatment facility, as may be required by the Division, for obtaining water samples to perform laboratory tests to ensure the proper functioning of the water treatment facility.

(m) A metering device to measure the flow of raw water and/or treated water is required for all surface water treatment plants and all new wells serving public water systems.

(n) Water from a well used as a source of water supply shall be disinfected unless otherwise approved by the Division and such additional water treatment as the Division may require for the drinking water to comply with the rules of this Chapter.

(o) Chemical water treatment equipment must be installed in such

a manner to prevent back-siphonage or overdosing of the chemicals to the water supply.

(p) Each public water system with a surface water source or a ground water source under the direct influence of surface water must provide treatment of that source water that complies with these treatment technique requirements. The treatment technique requirements consist of installing and properly operating water treatment processes which reliably achieve:

1. At least 99.9 percent (3-log) removal and/or inactivation of *Giardia lamblia* cysts between a point where the raw water is not subject to recontamination by surface water runoff and a point downstream before or at the first customer; and

2. At least 99.99 percent (4-log) removal and/or inactivation of viruses between a point where the raw water is not subject to recontamination by surface water runoff and a point downstream before or at the first customer.

3. At least 99 percent (2-log) removal of *Cryptosporidium* between a point where the raw water is not subject to recontamination by surface water runoff and a point downstream before or at the first customer for filtered systems. This treatment technique requirement is applicable to Subpart H systems serving at least 10,000 people, beginning January 1, 2002, and to systems serving fewer than 10,000 people, beginning January 14, 2005.

(q) Effective June 29, 1993, each public water system with a surface water source or a ground water source under the direct influence of surface water source shall conduct continuous monitoring of the residual disinfectant concentration of the water entering the distribution system. The continuous online chlorine analyzer shall be calibrated in accordance with EPA Method 334.0. Systems must record the results of the residual disinfectant monitoring every fifteen (15) minutes, and record and report the lowest value each day, except if there is a failure in the continuous monitoring equipment, grab sampling every 4 hours may be conducted in lieu of continuous monitoring, but for no more than 5

working days following the failure of the equipment, and systems serving 3,300 or fewer persons may take grab samples in lieu of providing continuous monitoring on an ongoing basis at the frequencies each day prescribed below:

Population Served	Samples per day ¹
500 or fewer	1
501 to 1,000	2
1,001 to 2,500	3
2,501 to 3,300	4

Note: ¹ The day's samples cannot be taken at the same time. The sampling intervals are subject to Division review and approval.

The residual disinfectant concentration in the water entering the distribution system cannot be less than 0.2 mg/L for more than four hours. If at any time the residual disinfectant concentration falls below 0.2 mg/L in a system using grab sampling in lieu of continuous monitoring, the system must take a grab sample every 4 hours until the residual disinfectant concentration is equal to or greater than 0.2 mg/L.

1. Maintenance of the disinfectant residual in the distribution system must conform to paragraph (2) of Rule 391-3-5-.14. The residual disinfectant concentration must be measured at least at the same points in the distribution system and at the same time as total coliforms are sampled, except that the Division may allow a public water system which uses both a surface water source or a ground water source under the direct influence of surface water, and a ground water source to take disinfectant residual samples at points other than the total coliform sampling points if the Division determines that such points are more representative of treated (disinfected) water quality within the distribution system. (r) Filter backwash recycling requirement: 40 CFR § 141.76 is hereby incorporated by reference. All subpart H systems that employ conventional filtration or direct filtration treatment and that recycle spent filter backwash water, thickener supernatant, or liquids from dewatering processes must meet the requirements in paragraphs (b), (c) and (d) of 40 CFR § 141.76.

1. Treatment technique requirement. Any system that recycles spent filter backwash water, thickener supernatant, or liquids from dewatering processes must return these flows through the processes of a system's existing conventional or direct filtration system as defined in 40 CFR § 141.2 or at an alternate location approved by the Division by June 8, 2004. If capital improvements are required to modify the recycle location to meet this requirement, all capital improvements must be completed no later than June 8, 2006.

2. Record keeping. The system must collect and retain on file recycle flow information specified in paragraphs (d)(1) through (6) or 40 CFR § 141.76 for review and evaluation by the Division beginning June 8, 2004.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Deviation from Approved Plans and Specifications" adopted. F. Sept. 6, 1973; eff. Sept. 26, 1973. **Repealed:** New Rule entitled "Water Treatment Facilities" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Amended:** F. July 15, 1983; eff. Aug. 4, 1983. **Amended:** F. May 12, 1989; eff. June 1, 1989. **Amended:** F. Dec. 4, 1990; eff. Dec. 24, 1990. **Amended:** F. June 25, 1992; eff. July 15, 1992. **Amended:** F. Sept. 26, 1997; eff. Oct. 16, 1997. **Amended:** F. Sept. 29, 2000; eff. Oct. 19, 2000. **Amended:** F. Dec. 10, 2002; eff. Dec. 30, 2002. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.10 Distribution System. Amended.

(1) **Design for Flow and Pressure.** The water distribution system must be designed and the water lines sufficiently sized to furnish at all times the instantaneous demand flow of water required and to maintain at all times a pressure of twenty (20) pounds per square inch at each service connection in the distribution system under all conditions of flow.

(2) **Looped Lines.** Distribution lines must be looped whenever possible.

(3) **Metering.** Beginning January 1, 1998, all new services connected to community and non-transient non-community water systems shall be metered, unless specifically directed otherwise by the Director. For existing water systems, metering of existing services shall be performed when required by the Director.

(4) **Prevent Contamination.** It is the responsibility of the supplier of water to maintain the distribution system to prevent contamination of the drinking water and to provide the required pressure and flow at all times.

(5) **Minimum Pipe Size.** The minimum size water main shall be two (2) inches in nominal diameter. The Division may allow for a departure in sizing provided it is justified by hydraulic analysis and future water use of the area to be served and such departures will be considered only in special circumstances.

(6) **Lines in Contaminated Areas.** Water lines must not be installed in contaminated areas such as sanitary landfill or dump areas.

(7) **Sewer Line Contact.** No water main or pipe shall pass through or come into contact with any part of a sewer or sewer manhole.

(8) **Minimum Cover.** The minimum recommended cover for water distribution mains or lines shall be twenty-four (24) inches.

(9) **Installation Requirements.** All newly installed distribution mains and appurtenances shall be flushed, pressure tested and disinfected.

(10) **Lead Free.** Any pipe, solder or flux which is used in the installation or repair of any public water distribution system shall be lead free with not more than 8.0% lead in pipes and fittings; and not more than 0.2% lead in solders and flux. This does not apply to leaded joints necessary for the repair of cast iron pipes.

(11) **Notification of Lead-containing Service Lines.** Suppliers of water shall identify and report to the Division any lead pipe and/or lead service connections known to be installed in the distribution system. Suppliers shall adopt a local plumbing code that requires use of lead free solder for plumbing.

(12) **Infrastructure Security.** Public water distribution network and its related components must be protected to prevent unauthorized tampering.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Water Treatment Facilities" adopted. F. Sept. 6, 1973; eff. Sept. 26, 1973. **Repealed:** New Rule entitled "Distribution System" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Repealed:** New Rule of same title adopted. F. May 12, 1989; eff. June 1, 1989. **Amended:** F. Sept. 26, 1997; eff. Oct. 16, 1997. **Amended:** F. Dec. 10, 2002; eff. Dec. 30, 2002. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.11 Storage Tanks. Amended.

(1) **Tank Requirements.** All storage tanks must be provided with a permanent cover, screened vents and openings, overflow piping and means of draining.

(2) **Interior Paint.** The paint used for the interior of a storage tank must be approved by the Division.

(3) **Approval for Repairs.** Repairs and renovations to existing storage tanks that may affect the quality of the drinking water must receive approval from the Division prior to starting such work. Upon completion of such work the storage tank must be disinfected according to Rule 391-3-5-.12.

(4) **Contamination Prevention.** It is the owner's responsibility to maintain the storage tank or tanks to prevent contamination of the drinking water by infiltration or other means.

(5) **Buried Tanks.** Buried or semi-buried storage tanks must have the ground surface sloping away from the facility.

(6) **Pressure Tanks.** Hydropneumatic pressure tanks must be provided with devices for maintaining the air-water volume at the designed water level and working pressures.

(7) **Pre-Service Requirements.** All new storage tanks must be cleaned, tested for leakage, and must be disinfected according to Rule 391-3-5-.12.

Authority Ga. L. 1977, p. 351, *et seq.*, O.C.G.A. Sec. 12-5-170 *et seq.*, as amended. **History.** Original rule entitled "Wells" was filed on September 6, 1973; effective September 26, 1973. **Amended:** Rule repealed and a new Rule entitled "Storage Tanks" adopted. Filed July 5, 1977; effective July 26, 1977, as specified by Rule 391-3-5-.47. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.12 Disinfection. Amended.

(1) **Disinfection Requirements.** All newly constructed public water systems including extensions, additions, modifications, or repairs to existing public water systems including water mains, storage tanks, treatment plants, wells, or any other pipes or parts of the public water system which may affect the quality of the drinking water which is delivered, treated or stored, must be disinfected before being placed into service by the supplier or water by one of the following methods:

(a) Water mains. Any new or repaired water main must be disinfected in accordance with the latest edition of American Water Works Association (AWWA) Standard C651.

(b) Storage facilities. Any new or repaired water storage facility must be disinfected in accordance with the latest edition of American Water Works Association (AWWA) Standard C652.

(c) Water treatment plants. Any new or repaired portion of a water treatment plant must be disinfected in accordance with the latest edition of American Water Works Association (AWWA) Standard C653.

(d) Wells. Any new well or existing well that has been rehabilitated or reworked must be disinfected in accordance with the latest edition of American Water Works Association (AWWA) Standard C654.

(e) Any system required to develop a disinfection profile in accordance with the provisions specified in sections (8)(c)(i) and (ii) of Rule 391-3-5-.20 and that decides to make a significant change to its disinfection practice must consult with the Division prior to making such change. Significant changes to disinfection practice are: changes to the point of disinfection; changes to the disinfectant(s) used in the treatment plant; changes to the disinfection practice by the Division. Any system that is modifying its disinfection practice

must calculate its disinfection benchmark as specified in section (8)(c)(iii) of Rule 391-3-5-.20.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Springs" adopted. F. Sept. 6, 1973; eff. Sept. 26, 1973. **Repealed:** New Rule entitled "Disinfection" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Amended:** F. July 15, 1983; eff. Aug. 4, 1983. **Amended:** F. May 12, 1989; eff. June 1, 1989. **Repealed:** New Rule of same title adopted. F. Dec. 4, 1990; eff. Dec. 24, 1990. **Amended:** F. Sept. 29, 2000; eff. Oct. 19, 2000. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.13 Cross-Connections. Amended.

(1) **Prohibitions.** No person shall construct, maintain or operate a physical arrangement whereby a public water system is or may be connected directly or indirectly with a non-potable water system or non-permitted water system, sewer, drain, conduit, pool, storage reservoir, plumbing fixture, or other device which contains or may contain contaminated water, liquid, gasses, sewage or other waste of unknown or unsafe quality, which may be capable of imparting contamination to the public water system as the results of backflow, bypass arrangements, jumper connections, removable sections, swivel or changeover devices, or other temporary, permanent or potential connections through which or because of which back-flow or back-siphonage could or would occur.

(2) **Contamination Prevention.** A supplier of water or any person having possession or control of facilities which may cause the contamination of a public water system has the responsibility to prevent water from unapproved sources or any contaminants from entering the public water system by such physical arrangements cited in paragraph (1) of this Section.

(3) **Purchasers and Resellers.** Any person connecting to and purchasing water from a public water system and reselling it to others is considered a supplier of the water so purchased as well as a consumer, and is also responsible for the quality of such water.

(4) **Cross-Connection Control Program.** A supplier shall, when requested by the Division, develop a control program for the elimination and prevention of all cross-connections. A written plan for the program shall be submitted to the Division for review and approval within two (2) years or less in accordance with a written request by the Division. When the plan is approved, the owner shall implement the program immediately.

(5) **Conformance with National Standards.** The procedures for back-flow and back-siphonage prevention and cross-connection

control shall conform to those recommended by the American Water Works Association, Manual 14, and the U.S. Environmental Protection Agency Cross-Connection Manual.

(6) **Backflow Prevention Assemblies Field Testing.** The supplier shall require that all backflow prevention assemblies installed pursuant to this section be field tested following installation, repair, or relocation and at least annually thereafter.

(7) **Certified Backflow Testing.** After October 1, 2004, all required field testing shall be performed by persons who are certified in the testing of backflow prevention assemblies by the Georgia Statewide Backflow Prevention Assembly Certification Program, as approved by the Division, the American Backflow Prevention Association (ABPA), the American Society of Sanitary Engineers (ASSE) or the University of Florida TREEO Center.

(8) **Gauge Accuracy.** Gauges used in the testing of backflow prevention assemblies shall be tested for accuracy annually in accordance with the University of Southern California Manual of Cross-Connection Control or American Water Works Association Manual 14. Public water systems shall require testers to include test gauge serial numbers on "Test and Maintenance" report forms and ensure testers have gauges tested for accuracy.

(9) **Record Maintenance.** Each water supplier shall maintain records of the following for a minimum of three (3) years:

(a) Most current hazard assessment, conducted pursuant to Section 608 of the Georgia State Minimum Standard Plumbing Code (International Plumbing Code);

(b) Locations and types of backflow protection and associated hazards;

(c) Results of all backflow prevention assembly field testing and air gap inspections; and

(d) Repairs made to, or replacement or relocation of, backflow protection.

(e) Summaries of the information in sections (9)(a) - (d) shall be available to the Division on request for a minimum of three years.

(f) The supplier shall ensure that backflow prevention assemblies that fail the field test are repaired or replaced within thirty (30) days.

(g) The supplier shall ensure that bypass piping installed around any approved backflow preventer is equipped with a backflow preventer providing an equivalent level of protection.

(h) Reduced pressure principal backflow prevention assemblies shall not be installed in any location subject to possible flooding. This includes pits and/or vaults which are not provided with a gravity drain to the ground's surface that is capable of exceeding the discharge rate of the relief valve.

(i) Each supplier shall notify the Division of any known incident of backflow into the public water system as soon as possible but no later than the end of the next business day upon discovery of the incident. If requested to do so by the Division, the supplier shall submit a written report of the incident describing the nature and severity of the backflow, the actions taken by the water supplier in response to the incident, and the action plan intended to prevent such incidents in the future.

(j) The supplier of water shall deny or discontinue water service to a commercial consumer if a required backflow prevention device is not installed or properly maintained. Water service shall not be restored to such premises until the deficiencies have been corrected or eliminated to the satisfaction of the supplier and the Division. Residential connections shall be maintained in accordance with the Georgia State Minimum Standard Plumbing Code (International Plumbing Code).

Authority Ga. L. 1977, p. 351, *et seq.*, O.C.G.A. Sec. 12-5-170 *et seq.*, as amended. **History.** Original Rule entitled "Storage Tanks and Distribution System" was filed on September 6, 1973; effective September 26, 1973. **Amended:** Rule repealed and a new Rule entitled "Cross Connections" adopted. Filed July 5, 1977; effective July

26, 1977, as specified by Rule 391-3-5-.47. **Amended:** Filed July 15, 1983; effective August 4, 1983. **Amended:** F. Dec. 4, 1990; eff. Dec. 24, 1990. **Amended:** F. Dec. 21, 2004; eff. Jan. 10, 2005. **Amended:** New title "Cross-Connections. Amended." F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.14 Operation. Amended.

(1) **Compliance with Safe Drinking Water Rules.** A supplier of water shall treat the water supplied so the water complies with the Safe Drinking Water rules of this Chapter. Public water systems shall not use bottled water to achieve compliance with a maximum contaminant level (MCL). Bottled water may be used on a temporary basis to avoid unreasonable risk to health. Community and non-transient non-community water systems shall not use point-of-use or point-of-entry treatment units to achieve compliance with an MCL or a treatment technique requirement.

(2) **Continuous Chlorination.** The supplier of water must continuously chlorinate the water to maintain a detectable residual of free chlorine in all parts of the distribution system in the recommended amount of at least 0.2 parts per million, and such additional amounts as may be determined necessary by the Division, unless other means of disinfection have been approved by the Director. If the residual disinfectant concentration is measured by approved analytical methods and not detected, the supplier may, upon approval by the Division, determine and report detectability by the use of heterotrophic plate count measurements as required by 40 CFR § 141.72 (1989) and other applicable paragraphs of 40 CFR Part 141.

(3) **Disinfection Waiver.** After consideration of the microbiological quality of the source of water supply, the local geology, the population served and the extent of the water distribution system, the disinfection treatment may be waived by the Director.

(4) **Fluoridation Requirements.** The supplier of water of a fluoridated public water system shall daily sample and analyze the fluoride concentration of the drinking water. Daily records of the analytical results shall be kept on forms provided by the Division or on forms acceptable to the Division and a copy of the result submitted to the Division in accordance with Rule 391- 3-5-.30.

(5) **Surface Water Source Certified Operator.** A supplier having a surface water source must have a certified operator on duty and onsite at all times when the water plant is in operation. A supplier having a groundwater source under the direct influence of surface water must have a certified operator on duty and onsite at all times when the water plant is in operation, unless otherwise approved by the Division, depending upon the complexity of the water treatment processes, quality of the water sources, and the size of the system.

(6) **Groundwater Source Certified Operator.** A supplier having only ground water sources must have a certified operator to comply with the classification prescribed in Section 391-3-5-.39 of this Chapter. The Director may find that the availability of a certified operator to a system with only groundwater sources is sufficient to comply with Section 391-3-5-.39 of this Chapter and may so allow, but only if the Director determines that the complexity of the water treatment processes, quality of the water sources, and the size of the system so warrant.

(7) **Record Maintenance.** The supplier of water shall maintain daily records of the operation of the water treatment facility and water distribution system as may be required by the Division including the amount of water treated daily, results of the performance of daily tests pertinent to the control of the water treatment processes, disinfectant residuals, and tests performed in the water distribution system. Daily records shall be kept by the supplier on forms furnished by the Division and a copy of the record submitted to the Division in accordance with Rule 391-3-5-.30. Based on the complexity of the water treatment process, the quality of the water sources, and the size of the system, the Director may establish less frequent maintenance of record requirements for small groundwater systems.

(8) **Microbiological Laboratory.** All community water systems which have a surface water source with water treatment facilities and those public water systems having only a ground water source or only a water distribution system and serving a population of

more than 12,900 must have, or have available, the services of a microbiological laboratory certified by the Division to perform the microbiological tests necessary for compliance with the maximum microbiological contaminant levels. The laboratory and equipment must be kept in good working order at all times.

(9) **Summary Microbiological Analytical Results.** A supplier of water required to have, or have available, a microbiological laboratory under paragraph (8) of Section 391-3-5-.14 shall collect and analyze drinking water samples in accordance with the minimum number specified in paragraph (1) of Section 391-3-5-.23 and such additional samples as may be required by the Director. The supplier shall furnish the Division, on forms provided by the Division, a monthly microbiological summary of the number of samples analyzed and the results in accordance with Section 391-3-5-.30.

(10) **Routine Microbiological Samples.** The supplier of water shall collect routine drinking water samples for microbiological analysis as follows:

(a) the minimum number of routine samples per month shall be in accordance with paragraph (1) of Section 391-3-5-.23;

(b) at the treatment plant and at various points in the distribution system which are representative of the drinking water when three or more samples per month are required; or

(c) at various points in the distribution system which are representative of the drinking water when only one or two samples per month are required.

(11) **Certified Laboratories.** For the purposes of determining compliance with Rules 391- 3-5-.18, .19, .20, .21, .22, .23, .24, .25, .26, .27 samples may be considered only if they have been analyzed by a laboratory certified by the Division, except that measurements used solely for operational control, including but not limited to turbidity, free chlorine residual, fluoride residual, temperature, pH, conductivity, calcium, alkalinity,

orthophosphate, chloramines, chlorine dioxide, chlorite and silica may be performed by any person acceptable to the Division.

(12) **Operations and Maintenance Plan.** All public surface water and ground water under the direct influence of surface water systems shall develop an Operations and Maintenance Plan (O & M Plan). The plan shall be prepared in accordance with the Division's "*Operation and Maintenance Plan — Guidance Manual for Preparing Public Water Supply System O & M Plans*", latest edition. The plan shall be updated at intervals determined by the Director. For public groundwater systems and systems that are using alternate treatment technologies, development of such a plan may be required by the Director when the complexity of the water treatment processes, quality of the water sources, and the size of the system so warrant.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Disinfection" adopted. F. Sept. 6, 1973; eff. Sept. 26, 1973. **Repealed:** New Rule entitled "Operation" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Amended:** F. July 15, 1983; eff. Aug. 4, 1983. **Amended:** F. May 12, 1989; eff. June 1, 1989. **Amended:** F. Dec. 4, 1990; eff. Dec. 24, 1990. **Amended:** F. Mar. 10, 1994; eff. Mar. 30, 1994. **Amended:** F. Sept. 26, 1977; eff. Oct. 16, 1997. **Amended:** F. Sept. 24, 1999; eff. Oct. 14, 1999. **Amended:** F. Sept. 29, 2000; eff. Oct. 19, 2000. **Amended:** F. June 8, 2001; eff. June 28, 2001. **Amended:** F. Dec. 10, 2002; eff. Dec. 30, 2002. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.15 Record Maintenance. Amended.

(1) **Requirements for Records and Retention.** Any supplier of water shall retain on its premises or at a convenient location near its premises, the following records:

(a) Records of microbiological analyses and turbidity analyses made pursuant to these rules shall be kept for not less than five (5) years. Records of chemical analyses made pursuant to these rules shall be kept for not less than ten (10) years. Actual laboratory reports may be kept, or data may be transferred to tabular summaries, provided that the following information is included:

1. the date, place and time of sampling and the name of the person who collected the sample;

2. identification of the sample as to whether it was routine distribution system sample, check sample, raw or drinking water sample or other special purpose sample;

- 3. date of analysis;
- 4. laboratory and person responsible for performing analysis;
- 5. the analytical technique/method used; and
- 6. the results of the analysis.

(b) Records of action taken by the system to correct violations of these rules shall be kept for a period not less than three (3) years after the last action taken with respect to the particular violation involved.

(c) Copies of any written reports, summaries or communications relating to sanitary surveys of the system conducted by the system itself, by a private consultant, or by any local, state or federal agency, shall be kept for a period not less than ten (10) years after completion of the sanitary survey involved.

(d) Records concerning a variance or exemption granted to the system shall be kept for a period ending not less than five (5) years

following the expiration of such variance or exemption.

(e) Any system subject to the lead and copper requirements shall retain on its premises original records of all sampling data, analyses, reports, surveys, letters, evaluations, schedules, Division determinations, and any other information required by Section 391-3- 5-.25 or .30. Each water system shall retain the records required by this rule for no fewer than twelve (12) years.

(f) Systems must maintain the results of individual filter monitoring taken under Rule 391-3-5-.20(7)(c) and (8)(h) for at least three (3) years.

(g) Any system subject to disinfection profiling and benchmarking shall keep the results of the profile and the benchmark (including raw data and analysis) indefinitely.

(h) Copies of monitoring plans developed pursuant to this part shall be kept for the same period of time as the records of analyses taken under the plan are required to be kept under paragraph (1)(a) of this section, except as specified elsewhere in this part.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Operation" adopted. F. Sept. 6, 1973; eff. Sept. 26, 1973. **Repealed:** New Rule entitled "Record Maintenance" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Amended:** F. June 25, 1992; eff. July 15, 1992. **Amended:** F. Sept. 29, 2000; eff. Oct. 19, 2000. **Amended:** F. Dec. 10, 2002; eff. Dec. 30, 2002. **Amended:** F. May 27, 2009; eff. June 16, 2009. **Amended:** New title "Record Maintenance. Amended." F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.16 Fluoridation. Amended.

All potable water supplies in incorporated communities and counties lying wholly within this State must be fluoridated in compliance with the Act.

Authority Ga. L. 1973, p. 148, *et. seq.*, Ga. L. 1977, p. 351, *et seq.*, O.C.G.A. Sec. 12-5-170 *et seq.*, as amended. **History.** Original Rule entitled "Certificate of Approval" was filed on September 6, 1973; effective September 26, 1973. **Amended:** Rule repealed and new Rule entitled "Fluoridation" adopted. Filed July 5, 1977; effective July 26, 1977, as specified by Rule 391-3-5-.47. **Amended:** Rule repealed and a new Rule of the same title adopted. Filed July 15, 1983; effective August 4, 1983. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.17 Permit to Operate a Public Water System. Amended.

(1) **Permit Required from the Director.** Any person who owns or operates a public water system or who desires to commence operation of a public water system shall obtain a permit from the Director.

(2) **Permit Application.** Applicants for permits under Section 7 of the Act shall be on forms as may be prescribed and furnished by the Division. The permit application form shall be signed by the owner or their duly authorized agent. For privately owned community public water systems, the trustee of the water system must be clearly identified on the permit application.

(3) Additional Information. Any applicant for a permit whose application is pending final consideration shall upon the request of the Director provide such additional information as may be necessary to enable the Director to properly pass upon the application. Such additional information may include, but not be limited to, complete engineering report, quantitative and qualitative determinations of the source of water supply and drinking water, plans, specifications, maps, measurements, records, documentation to demonstrate system's financial, technical and managerial capacity with respect to drinking water regulations in effect or likely to be in effect, source water assessments and protection plan, water conservation plan, cross-connection plan, operations and maintenance plan, infrastructure protection plan, and all related material.

(4) **Complete Applications.** Applications for permits will be reviewed together with the submitted information and when the Director is satisfied that the application is complete a determination to issue or deny the permit will be made.

(5) **Public Participation.** Whenever in the judgment of the Director public participation may be required prior to the final

determination to issue or deny a permit the Director may give public notice of the proposed action. Public notice will be prepared and circulated in a manner designed to inform interested and potentially interested persons of the permit application. Procedures for circulation of the public notice shall include the following:

(a) Within the geographical area of the proposed or existing

public water system, the public notice shall be circulated by at least one of the following:

1. posting it in the post office or other public building near the premises of the proposed or existing public water system; or

2. publication in one (1) or more newspapers of general circulation in the area of the proposed or existing public water system.

(b) Posting of the public notice in the office of the Secretary of State.

(c) A copy of the public notice shall be mailed to the permit applicant and a copy shall be available at the Division office in Atlanta.

(d) Mailing of the public notice to any person or group upon request. The Division shall maintain a mailing list for distribution of public notices. Any person or group may request that their names be placed on the mailing list. The request shall be in writing to the Division office in Atlanta and shall be renewed in December of each year. Failure to renew the request shall result in the removal of such name from the mailing list.

(e) The Director shall provide a period of not less than thirty (30) days following the public notice in which interested persons may submit their written views with respect to the permit application. All written comments submitted during the thirty (30) day comment period will be retained by the Division and considered in the final determination of the permit application.

(f) The contents of the public notice will be in accordance with

applicable Federal regulations and State laws.

(6) **Public Hearing.** The Director shall hold a public hearing if he determines that there is sufficient public interest or need for a public hearing prior to the final determination to issue or deny a permit.

(a) Any public hearing held pursuant to this subsection shall be held in the geographical area of the proposed or existing public water system or other appropriate location at the discretion of the Director.

(b) The Director may hold one public hearing on related groups of permit applications.

(c) Public notice of any public hearing held pursuant to this subsection shall be provided at least thirty (30) days in advance of the hearing date and shall be circulated in accordance with paragraph (5) of this Section.

(7) **Permit Conditions.** A permit issued by the Director shall stipulate such terms, and conditions and schedules of compliance as the Director deems necessary to meet the requirements of these rules and which are consistent and in conformity with the Act and the Federal Act. Any permit issued pursuant to the Act may be subject to such monitoring, recording and reporting requirements as may be reasonably required by the Director including the installation, use and maintenance of monitoring equipment or methods; specific requirements for recording of monitoring results. The monitoring, recording and reporting requirements shall be specified in a permit issued, provided, however, the Director may modify or require additional monitoring, recording and reporting by written notification to the permittee.

(8) **Permit Transfers.** A permit issued by the Director may be transferred due to a change in ownership of the public water system. The permittee shall notify the succeeding owner by letter of the existing permit and shall surrender the permit to the Director

along with a copy of the letter to the succeeding owner. It shall be the succeeding owner's responsibility to request a transfer of the permit. A completed permit application shall be submitted to the Director on the forms prescribed and furnished by the Division within 30 days of transfer. The succeeding owner shall upon the request of the Director provide such additional information as may be necessary (including but not limited to proof of ownership and business plan) to enable the Director to transfer the permit.

(9) **Permit Application Denials.** Based on the information submitted or available to the Director, a permit application may be denied by the Director for any one of the following reasons where the proposed activity or system would:

(a) present an immediate or potential health hazard to the public, or

(b) not adequately supply water under sufficient pressure and flow at all times, or

(c) not meet the requirements of these rules or the Act.

(10) **Notice In Case of Application Denial.** In the event an applicant's permit is denied, the Director shall serve written notice of such action to the applicant setting forth in such notice the reason for the action.

(11) **Permit Expiration Term.** Each permit issued under this Section shall have a fixed term not to exceed ten (10) years. Upon expiration of such permit, a new permit may be issued by the Director if after a review the Director determines that the continued operation of such public water system meets or will meet all applicable drinking water standards, maximum contaminant levels and all requirements of the Act and these rules. Any permit issued under this paragraph may include any of the terms, conditions and schedules of compliance under paragraph (7) of this Section.

(12) **Revocation, Suspension, or Modification.** The Director may revoke, suspend, or modify a permit issued under this Section for cause, including, but not limited to, the following:

(a) violation of any condition of said permit;

(b) obtaining a permit by misrepresentation, or failure to disclose fully all relevant facts;

(c) change in any condition that requires either:

1. a temporary or permanent decrease in the maximum contaminant levels; or

2. elimination of the permitted operation.

(13) Notice In Case of Permit Revocation, Suspension, or Modification. In the event of modification, suspension, or revocation of a permit, the Director shall serve written notice of such action on the permit holder and shall set forth in such notice the reason for the action.

(14) Access by Division. The Director or any agents or employees of the Division shall be permitted access in or upon any private or public property at all reasonable times for the purpose of investigating conditions, processes, methods of treatment, records relating to the operation of any public water system, compliance with any operating permit issued, to make sanitary surveys, to determine compliance with the Act and any rules promulgated thereunder, or to make such investigations and studies as the Director deems advisable and necessary for the protection of the public health.

(15) **Previous Permits.** In the event of reissue, modification, suspension, revocation or transfer of a permit all previously issued permits for the system shall be surrendered to the Division upon written notice by the Director.

(16) **Compliance with Wellhead Protection.** All community public water systems utilizing ground water sources and serving a municipality, county, or an authority are required to comply with the Wellhead Protection section of this rule (Section 391-3-5-.40).

(17) **Conformance with Minimum Standards.** Design and construction of all public water systems shall conform to the latest

edition of the Division's "Minimum Standards for Public Water Systems".

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Water Samples" adopted. F. Sept. 6, 1973; eff. Sept. 26, 1973. **Repealed:** New Rule entitled "Permit to Operate Public Water System" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Amended:** F. July 15, 1983; eff. Aug. 4, 1983. **Repealed:** New Rule of same title adopted. F. May 12, 1989; eff. June 1, 1989. **Amended:** F. Dec. 4, 1990; eff. Dec. 24, 1990. **Amended:** F. June 25, 1992; eff. July 15, 1992. **Amended:** F. June 7, 1993; eff. June 27, 1993. **Amended:** F. Sept. 26, 1997; eff. Oct. 16, 1997. **Amended:** F. Sept. 29, 2000; eff. Oct. 19, 2000. **Amended:** F. Dec. 10, 2002; eff. Dec. 30, 2002. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.18 Primary Maximum Contaminant Levels for Drinking Water. Amended.

(1) **Primary MCLs for Inorganics.** INORGANIC CHEMICALS - The maximum contaminant levels (MCLs) for antimony, arsenic, asbestos, barium, beryllium, cadmium, chromium, mercury, nickel, selenium and thallium of this section apply to community water systems and non-transient, non-community water systems. The MCLs for fluoride in this section apply to community water systems. The MCLs for nitrate, nitrite, and total nitrate-nitrite of this section apply to all (CWS, NTNCWS, TNCWS) public water systems.

(a) The following are the maximum contaminant levels for inorganic chemicals:

Contaminant	Maximum Contaminant Level (mg/L)	Applicable Systems
Antimony	0.006	CWS, NTNCWS
Arsenic	0.010	CWS, NTNCWS
Asbestos	7 Million Fibers/Liter Longer than 10 µm	CWS, NTNCWS
Barium	2	CWS, NTNCWS
Beryllium	0.004	CWS, NTNCWS
Cadmium	0.005	CWS, NTNCWS
Chromium	0.1	CWS, NTNCWS
Cyanide	0.2	CWS, NTNCWS
Fluoride ^{1,2}	4.0	CWS
Lead	see 391-3-525 Treatment Technique	CWS, NTNCWS

Contaminant	Maximum Contaminant Level (mg/L)	Applicable Systems
Mercury	0.002	CWS, NTNCWS
Nickel	0.1	CWS, NTNCWS
Nitrate	10 (as N)	CWS, NTNCWS, TNCWS
Nitrite	1 (as N)	CWS, NTNCWS, TNCWS
Total Nitrate + Nitrite	10 (as N)	CWS, NTNCWS, TNCWS
Selenium	0.05	CWS, NTNCWS
Thallium	0.002	CWS, NTNCWS

NOTES:

- 1. Effective date for fluoride was October 2, 1987.
- 2. Fluoride also has a secondary MCL, Section 391-3-5-.19(2).

(b) At the discretion of the Director, nitrate levels not to exceed

20 mg/L may be allowed in a non-community water system if the supplier of water demonstrates to the satisfaction of the Director that:

1. such water will not be available to children under 6 months of age;

2. there will be continuous posting of the fact that nitrate levels exceed 10 mg/L and the potential health effects of exposure;

3. local and State public health authorities will be notified annually of nitrate levels that exceed 10 mg/L;

4. no adverse health effects shall result.

(2) Primary MCLs for Organics. ORGANIC CHEMICALS -

The following maximum contaminant levels for organic contaminants apply to community water systems and non-transient, non-community water systems. Compliance with maximum contaminant levels for the following organics is to be calculated pursuant to Section 391-3-5-.22.

(a) Synthetic Organic Chemicals, Pesticides and Polychlorinated biphenyls

Contaminant	Maximum Contaminant Level
	(mg/L)
Alachlor	0.002
Aldicarb	Deferred
Aldicarb sulfone	Deferred
Aldicarb sulfoxide	Deferred
Atrazine	0.003
Benzo(a)Pyrene	0.0002
Carbofuran	0.04
Chlordane	0.002
Dalapon	0.2
Di(2-ethylhexyl) adipate	0.4
Di(2-ethylhexyl) phthalate	0.006
Dibromochloropropane (DBCP)	0.0002
Dinoseb	0.007
Diquat	0.02
2,4-D	0.07
Endothall	0.1
Endrin	0.002
Ethylene dibromide (EDB)	0.00005
Glyphosate	0.7
Heptachlor	0.0004
Heptachlor Epoxide	0.0002
Hexachlorobenzene	0.001

Contaminant	Maximum Contaminant Level (mg/L)
Hexachlorocyclopentadiene	0.05
Lindane	0.0002
Methoxychlor	0.04
Oxamyl (Vydate)	0.2
Pentachlorophenol	0.001
Picloram	0.5
Polychlorinated biphenyls (PCBs)	0.0005
Simazine	0.004
Toxaphene	0.003
2,4,5-TP (Silvex)	0.05
2,3,7,8-TCDD (Dioxin)	3×10^{-8}

(b) Volatile Organic Contaminants (VOCs)

Contaminant	Maximum Contaminant (mg/L)	Level
Vinyl chloride	0.002	
Benzene	0.005	
Carbon tetrachloride	0.005	
1,2-Dichloroethane	0.005	
Trichloroethylene	0.005	
para-Dichlorobenzene	0.075	
1,1-Dichloroethylene	0.007	
1,1,1-Trichloroethane	0.2	
cis-1,2-Dichloroethylene	0.07	
1,2-Dichloropropane	0.005	
Ethylbenzene	0.7	
Monochlorobenzene	0.1	
o-Dichlorobenzene	0.6	

Contaminant	Maximum Contaminant Level (mg/L)
Styrene	0.1
Tetrachloroethylene	0.005
Toluene	1
trans-1,2-Dichloroethylene	0.1
Xylenes (total)	10
Dichloromethane	0.005
1,2,4-Trichlorobenzene	0.07
1,1,2-Trichloroethane	0.005

(3) **Primary MCLs for Turbidity.** Turbidity – Treatment Technique Requirements:

(a) The maximum contaminant level for turbidity is determined by a treatment technique requirement as set forth in this Section.

(b) The treatment technique requirement for turbidity is applicable to both community water systems and non-community water systems using surface water sources or ground water sources under the direct influence of surface water in whole or in part. The treatment technique requirement for turbidity in drinking water, measured at a representative point(s) in the filtered water is:

1. Less than or equal to 0.3 turbidity unit in at least 95 percent of the monthly measurements. One turbidity unit is the maximum allowable level and must not be exceeded at any time.

2. Five turbidity units is the maximum allowable level and must not be exceeded at any time.

3. In accordance with 40 CFR § 141.73, the Division may allow higher turbidity levels for slow sand filtration, diatomaceous earth filtration, or other filtration technologies.

4. Beginning January 1, 2002, public water systems that use surface water or ground water under the direct influence of surface

water and serve at least 10,000 people must meet the filtration requirements specified in 40 CFR § 141.173 (see Rule 391-3-5-.20(5)).

5. The Enhanced Filtration and Disinfection requirements specified in 40 CFR, Subpart P are applicable to Subpart H systems serving at least 10,000 people (see Rule 391-3-5-.20(8)).

6. Beginning January 14, 2005, public water systems that use surface water or ground water under the direct influence of surface water as a source and serve fewer than 10,000 people must meet the filtration and disinfection requirements in 40 CFR Part 141, Subpart T. This requirement is in addition to complying with requirements in Subpart H of 40 CFR Part 141 [see Rule 391-3-5-.20(8)].

(4) **Primary MCLs for Microbiologicals.** Microbiological - Maximum contaminant levels (MCLs) for microbiological contaminants.

(a) The MCL is based on the presence or absence of total coliforms in a sample, rather than coliform density.

1. For a system which collects at least 40 samples per month, if no more than 5.0 percent of the samples collected during a month are total coliform-positive, the system is in compliance with the MCL for total coliforms.

2. For a system which collects fewer than 40 samples per month, if no more than one sample collected during a month is total coliform-positive, the system is in compliance with the MCL for total coliforms.

(b) Any fecal coliform-positive repeat sample or *E. coli*-positive repeat sample, or any total coliform-positive repeat sample following a fecal coliform-positive or *E. coli*-positive routine sample constitutes a violation of the MCL for total coliforms. For purposes of the public notification requirements in Section 391-3-5-.32, this is a violation that may pose an acute risk to health.

(c) A public water system must determine compliance with the

MCL for total coliforms in paragraphs (a) and (b) of this Section for each month in which it is required to monitor for total coliforms.

(5) **Primary MCLs for Radioactivity and Radionuclides.** Radioactivity - Maximum contaminant levels for Radium-226, Radium-228, gross alpha particle radioactivity, beta particle and photon radioactivity from man-made radionuclides in community water systems.

(a) The following are the maximum contaminant levels for Radium-226, Radium-228, gross alpha radioactivity, and Uranium:

Radionuclides / Radioactivity	Maximum Contaminant Level
Combined Radium-226 and Radium-228 (²²⁶ Ra, ²²⁸ Ra)	5 pCi/L
Gross alpha particle activity (including Radium-226 but excluding Radon and Uranium)	15 pCi/L
Uranium	30 μg/L

(b) The average annual concentration of beta particle and photon radioactivity from manmade radionuclides in drinking water shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem per year.

(c) Except for the radionuclides listed in Table A, the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents shall be calculated on the basis of a 2 liter per day drinking water intake using the 168 hour data listed in *"Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air or Water for Occupational Exposure"*, NBS Handbook 69 as amended August,

1963, U.S. Department of Commerce. If two or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ shall not exceed 4 millirem per year.

TABLE A. — Average annual concentrations assumed for the purpose of this rule to produce a total body or organ dose of 4 millirem per year.

Radionuclide	Critical Organ	Average Annual Concentration
Tritium (³ H)	Total Body	20,000 pCi/L
Strontium-90 (⁹⁰ Sr)	Bone Marrow	8 pCi/L

(6) PrimaryMCLsforTrihalomethanes.TRIHALOMETHANES-Maximumcontaminantlevelfortrihalomethanes:seesection(7),DISINFECTANTSandDISINFECTIONBYPRODUCTS, below.

(7) Primary MCLs for Disinfectants and Disinfection
Byproducts. DISINFECTANTS and DISINFECTION
BYPRODUCTS (D/DBPs). Beginning January 1, 2002, this section shall be applicable as specified below:

(a) The maximum contaminant levels (MCLs) for disinfection byproducts (DBPs) are as specified in section 40 CFR § 141.64 and the maximum residual disinfectant levels (MRDLs) are as specified in section 40 CFR § 141.65.

Disinfection Byproduct	Maximum Level (mg/L)	Contaminant
Total trihalomethanes	0.080	
Haloacetic acids (five)	0.060	
Bromate	0.010	

Disinfection Byproduct	Maximum Level (mg/L)	Contaminant
Chlorite	1.0	

Disinfectant Residuals	MaximumResidualDisinfectant Level (mg/L)
Chlorine	4.0 (as Cl ₂)
Chloramines	4.0 (as Cl ₂)
Chlorine Dioxide	0.8 (as ClO ₂)

(b) Beginning January 1, 2002, community and non-transient, non-community Subpart H water systems which serve a population of 10,000 people or more must comply with this section. All systems must comply with these MCLs until the date specified for Subpart V compliance in 40 CFR § 141.620(c).

(c) Beginning January 1, 2004, community and non-transient, non-community Subpart H water systems serving fewer than 10,000 people and systems using only ground water not under the direct influence of surface water must comply with this section. All systems must comply with these MCLs until the date specified for Subpart V compliance in 40 CFR § 141.620(c).

(d) The Subpart V MCLs for TTHM and HAA5 must be complied with as a locational running annual average at each monitoring location beginning the date specified for Subpart V compliance in 40 CFR § 141.620(c).

(e) A system that is installing granular activated carbon (GAC) or membrane technology to comply with this section may apply to the Division for an extension of up to 24 months past the dates in paragraphs (b) and (c) of this section, but not beyond December 31, 2003.

(f) Transient non-community Subpart H water systems serving 10,000 or more persons and using chlorine dioxide as a

disinfectant or oxidant must comply with the chlorine dioxide MRDL beginning January 1, 2002.

(g) Transient non-community Subpart H water systems serving fewer than 10,000 persons and using chlorine dioxide as a disinfectant or oxidant and systems using only ground water not under the direct influence of surface water and using chlorine dioxide as a disinfectant or oxidant must comply with the chlorine dioxide MRDL beginning January 1, 2004.

(h) Maximum Contamination Level Goals (MCLG). The maximum contaminant level goals for organic contaminants, inorganic contaminants, and microbiological contaminants shall be in accordance with 40 CFR Part 141.50, 141.51, 141.53, and 141.54.

(i) The best technology, treatment technique, or other means available for achieving compliance with the maximum contaminant levels for disinfection byproducts identified in Section 391-3-5-.18(7)(a) shall be in accordance with 40 CFR, Part 141.64 (b).

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled —Operating Records" adopted. F. Sept. 6, 1973; eff. Sept. 26, 1973. **Repealed:** New Rule entitled —Primary Maximum Contaminant Levels for Drinking Water" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Amended:** F. July 15, 1983; eff. Aug. 4, 1983. **Repealed:** New Rule of same title adopted. F. May 12, 1989; eff. June 1, 1989. **Amended:** F. Dec. 4, 1990; eff. Dec. 24, 1990. **Repealed:** New Rule, same title adopted. F. June 25, 1992; eff. July 15, 1992. **Repealed:** New Rule of same title adopted. F. Mar. 10, 1994; eff. Mar. 30, 1994. **Amended:** F. Sept. 26, 1997; eff. Oct. 16, 1997. **Amended:** F. Sept. 29, 2000; eff. Oct. 19, 2000. **Amended:** F. June 8, 2001; eff. June 28, 2001. **Amended:** F. Dec. 10, 2002; eff. Dec. 30, 2002. **Amended:** F. Dec. 21, 2004; eff. Jan. 10, 2005. **Amended:** F. May 27, 2009; eff. June 16, 2009. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.19 Secondary Maximum Contaminant Levels for Drinking Water. Amended.

(1) Adverse Effects on Drinking Water. The drinking water should not contain any contaminant which will adversely affect the odor or appearance of the drinking water and consequently may cause a substantial number of the persons served by the public water system to discontinue its use or which may adversely affect the public welfare.

(2) **Secondary MCLs.** The Secondary maximum contaminant levels established below represent reasonable goals for drinking water quality:

Contaminant	Secondary Level
Aluminum (Al)	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 color units
Copper (Cu)	1.0 mg/L
Corrosivity	Non-corrosive
Fluoride (F)	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron (Fe)	0.3 mg/L
Manganese (Mn)	0.05 mg/L
Odor	3 threshold odor number
Silver (Ag)	0.1 mg/L
Sulfate	250 mg/L
Total dissolved solids	500 mg/L
Zinc (Zn)	5.0 mg/L

(3) **Standard Methods.** Any analyses required under this rule shall be conducted in accordance with the analytical recommendations set forth in the latest edition of "*Standard*

Methods of Examination of Water and Wastewater" as published by the American Public Health Association, or as such analyses may be modified by the Director.

(4) **Collect and Submit Samples for Analyses.** Upon written direction of the Director, the supplier shall collect drinking water samples and submit them to the Division's water laboratory or other laboratory for analyses in accordance with the schedule furnished to the supplier.

Authority Ga. L. 1977, p. 351, *et seq.*, O.C.G.A. Sec. 12-5-170 *et seq.*, as amended. **History.** Original Rule entitled "Drinking Water Standards" was filed on September 6, 1973; effective September 26, 1973. **Amended:** Rule repealed and a new Rule entitled "Microbiological Contaminant Sampling and Analytical Requirements" adopted. Filed July 5, 1977; effective July 26, 1977, as specified by Rule 391-3-5-.47. **Amended:** Filed July 15, 1983; effective August 4, 1983. **Repealed:** New Rule entitled "Secondary Maximum Contaminant Levels for Drinking Water" adopted. F. May 12, 1989; eff. Jun. 1, 1989. **Repealed:** New Rule, same title, adopted. F. Jun. 25, 1992; eff. Jul. 15, 1992. **Repealed:** New Rule, same title, adopted. F. Mar. 10, 1994; eff. Mar 30, 1994. **Amended:** F. Sept. 26, 1997; eff. Oct. 16, 1997. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.20 Turbidity Sampling and Analytical Requirements. Amended.

(1) Turbidity Testing Frequency. On and after June 29, 1993, representative samples of filtered water shall be taken and analyzed by said suppliers at least every four hours when the plant is in operation, for the purpose of making turbidity measurements to determine compliance with the treatment technique requirement of paragraph (3) of Section 391-3-5-.18. If the Division determines that a reduced sampling frequency in a non-community system will not pose a risk to public health, it can reduce the required sampling frequency in accordance with 40 CFR 141.74 for systems using slow sand filtration or filtration treatment other than conventional treatment, direct filtration, or diatomaceous earth filtration. The option of reducing the turbidity frequency shall be permitted only in those public water systems that practice disinfection and which maintain an active residual disinfectant in the distribution system and in those cases where the Division has indicated in writing that no unreasonable risk to health existed under the circumstances of this option. The turbidity measurements shall be made in accordance with the recommendations set forth in 40 CFR Part 141.22.

(2) **Exceedance Determination.** If the result of a turbidity analysis on and after June 29, 1993 indicates that the treatment technique requirement has been exceeded, the sampling and measurement shall be confirmed by resampling as soon as practicable and preferably within one hour. If the repeat sample confirms that the treatment technique requirement has been exceeded, the supplier of water shall consult with the primacy agency within 24 hours after learning about the violation (141.203(b)). If consultation does not occur within those 24 hours the violation is elevated to a Tier 1. The repeat sample shall be the sample of water used for the purpose of calculating compliance with the monthly treatment technique requirement. If the monthly treatment technique requirement is exceeded, or if the maximum

measured level exceeds the maximum allowable level, the supplier of water shall report to the Division and notify the public as directed in Sections 391-3-5-.30 and .32.

(3) **Applicability to Surface Water Sources.** The requirements of this Section shall apply only to public water systems, which use water obtained in whole or in part from surface water sources or ground water sources under the direct influence of surface water.

(4) **Compliance and Enforcement.** The Division has the authority to determine compliance or initiate enforcement action based upon analytical results or other information compiled by their sanctioned representatives or agencies.

(5) Filtration Requirements for Greater than 10,000 Population Water Systems. Beginning January 1, 2002, public water systems that use surface water or ground water under the direct influence of surface water and serve at least 10,000 people must meet the filtration requirements specified in 40 CFR § 141.173.

(6) **Enhanced Filtration Requirements.** The Enhanced Filtration and Disinfection requirements specified in 40 CFR, Subpart P are applicable to Subpart H systems serving at least 10,000 people.

(a) General requirements: 40 CFR, Subpart P § 141.170 is hereby incorporated by reference. Subpart H systems that did not conduct optional monitoring under § 141.172 because they served fewer than 10,000 persons when such monitoring was required, but serve more than 10,000 persons prior to January 14, 2005 must comply with §§ 141.170, 141.171, 141.173, 141.174, and 141.175. These systems must contact the Division and establish a disinfection benchmark. A system that decides to make a significant change to its disinfection practice, as described in § 141.172(c)(1)(i) through (iv) must obtain prior approval from the Division prior to making such change.

(b) Criteria for avoiding filtration: 40 CFR, Subpart P § 141.171

is hereby incorporated by reference.

(c) Disinfection profiling and benchmarking: 40 CFR, Subpart P § 141.172 is hereby incorporated by reference.

(d) Determination of systems required to profile: 40 CFR, Subpart P § 141.172(a) is hereby incorporated by reference.

(e) Disinfection profiling: 40 CFR, Subpart P § 141.172(b) is hereby incorporated by reference.

(f) Disinfection benchmarking: 40 CFR, Subpart P § 141.172(c) is hereby incorporated by reference.

(7) **Filtration.** 40 CFR, Subpart P § 141.173 is hereby incorporated by reference.

(a) Conventional filtration treatment or direct filtration: 40 CFR, Subpart P § 141.173(a) is hereby incorporated by reference. (For systems using conventional filtration or direct filtration, the turbidity level of representative samples of a system's filtered water must be less than or equal to 0.3 NTU (Nephelometric Turbidity Units) in at least 95 percent of the measurements taken each month, measured as specified in 40 CFR § 141.74(a) and (c), and the turbidity level of representative samples of a system's filtered water must at no time exceed 1 NTU, measured as specified in 40 CFR § 141.74(a) and (c)).

(b) Systems using filtration technologies other than conventional filtration treatment, direct filtration, slow sand filtration, or diatomaceous earth filtration: 40 CFR, Subpart P § 141.173(b) is hereby incorporated by reference. Beginning January 1, 2002, systems serving at least 10,000 people must meet the requirements for other filtration technologies referenced in 141.173(b).

(c) Filtration sampling requirements: 40 CFR, Subpart P § 141.174 is hereby incorporated by reference. (A public water system subject to the requirements of this section that provides conventional filtration treatment or direct filtration must conduct continuous monitoring of turbidity for each individual filter using an approved method in 40 CFR § 141.74(a) and must calibrate

turbidimeters using the procedure specified by the manufacturer. Systems must record the results of individual filter monitoring every fifteen (15) minutes. If there is a failure in the continuous turbidity monitoring equipment, the system must conduct grab sampling every four (4) hours in lieu of continuous monitoring, but for no more than five (5) working days following the failure of the equipment.)

(8) Filtration Requirements for Fewer than 10,000 Population Water Systems. Beginning January 14, 2005, public water systems that use surface water or ground water under the direct influence of surface water as a source and serve fewer than 10,000 people must meet the filtration and disinfection requirements in 40 CFR Part 141, Subpart T. This requirement is in addition to complying with requirements in Subpart H of 40 CFR Part 141.

(a) Beginning January 14, 2005, public water systems that use surface water or ground water under the direct influence of surface water and serve fewer than 10,000 people must meet the filtration requirements specified in 40 CFR §§ 141.550 through 141.553.

(b) Other filtration technologies: 40 CFR § 141.73(d) is hereby incorporated by reference. Beginning January 14, 2005, systems serving fewer than 10,000 people must meet the requirements for other filtration technologies in 40 CFR §§ 141.550 through 141.553.

(c) General requirements: 40 CFR, Subpart T § 141.500 is hereby incorporated by reference.

(d) Additional watershed control requirements for unfiltered systems: 40 CFR, Subpart T §§ 141.520 through 141.522 is hereby incorporated by reference. This is in addition to the continued requirement to comply with the filtration avoidance criteria in 40 CFR § 141.71.

(e) Disinfection Profile: 40 CFR, Subpart T §§ 141.530 through 141.536 is hereby incorporated by reference. This requirement applies both to community and non-transient non-community

water systems.

(f) Disinfection benchmark: 40 CFR, Subpart T §§ 141.540 through 141.544 is hereby incorporated by reference. If you are a subpart H system required to develop a disinfection profile under Section 391-3-5-.20(10)(e), your system must develop a disinfection benchmark if you decide to make a significant change to your disinfection practice. Before implementing a significant disinfection practice change, a prior approval from the Division must be obtained. Significant changes to disinfection practice include:

- 1. Changes to the point of disinfection;
- 2. Changes to the disinfectant(s) used in the treatment plant;
- 3. Changes to the disinfection process; or
- 4. Any other modification identified by the Division.

(g) Combined filter effluent requirements: 40 CFR, Subpart T § 141.550 through 141.553 is hereby incorporated by reference. This requirement applies to all subpart H systems which serve populations fewer than 10,000, are required to filter, and utilize filtration other than slow sand filtration or diatomaceous earth filtration.

1. For systems using conventional filtration or direct filtration, the turbidity level of representative samples of a system's filtered water must be less than or equal to 0.3 NTU in at least 95 percent of the measurements taken each month, and the maximum turbidity level of representative samples of a system's filtered water must at no time exceed 1 NTU. All measurements must be taken as described in 40 CFR § 141.74 (a) and (c).

2. For systems using "alternative" filtration (filtration other than slow sand filtration, diatomaceous earth filtration, conventional filtration, or direct filtration), the 95th percentile turbidity value, not to exceed 1 NTU, and the maximum turbidity value, not to exceed 5 NTU, shall be determined by the Division based on the demonstration as described in 40 CFR, Subpart T § 141.552. The

systems, using pilot plant studies or other means, must demonstrate that the system's filtration, in combination with disinfection treatment, consistently achieves: two-log (99%) removal of *Cryptosporidium* oocysts; three-log (99.9%) removal and/or inactivation of *Giardia lamblia* cysts; and four-log (99.99%) removal and/or inactivation of viruses.

(h) Individual filter turbidity requirements for systems utilizing conventional filtration or direct filtration: 40 CFR, Subpart T §§ 141.560 through 141.564 is hereby incorporated by reference. A subpart H public water system subject to the requirements of this section must conduct continuous monitoring of turbidity for each individual filter using an approved method in 40 CFR § 141.74(a) and must calibrate turbidimeters using the procedure specified by the manufacturer. Systems must record the results of individual filter monitoring every fifteen (15) minutes. If there is a failure in the continuous turbidity monitoring equipment, the system must conduct grab sampling every four (4) hours in lieu of continuous monitoring until the turbidimeter is back on-line. The system has fourteen (14) days to resume continuous monitoring before a violation is incurred.

1. Systems with two or fewer filters may conduct continuous monitoring of combined filter effluent turbidity in lieu of individual filter effluent turbidity monitoring, in accordance with the same requirements set forth in 40 CFR § 141.560 (a) through (d) and § 141.561.

2. Based on continuous turbidity monitoring of individual filters, the systems are required to take the follow-up actions described in 40 CFR § 141.563 (a), (b) and (c).

(i) Reporting and recordkeeping requirements: 40 CFR, Subpart T §§ 141.570 through 141.571 is hereby incorporated by reference. The items which must be reported and the frequency of reporting must be as specified in 40 CFR § 141.570. Based on the requirements of subpart T of 40 CFR Part 141, applicable systems must keep several required records, in addition to the

recordkeeping required under 40 CFR § 141.75. Specifically, the results of individual filter monitoring must be kept for at least three (3) years and the results of any disinfection profiling or benchmarking (including raw data and analysis) must be kept indefinitely.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Enforcement" adopted. F. Sept. 6, 1973; eff. Sept. 26, 1973. **Repealed:** New Rule entitled "Turbidity Sampling and Analytical Requirements" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Amended:** F. July 15, 1983; eff. Aug. 4, 1983. **Repealed:** New Rule same title adopted. F. May 12, 1989; eff. June 1, 1989. **Repealed:** New Rule of same title adopted. F. Dec. 4, 1990; eff. Dec. 24, 1990. **Amended:** F. June 25, 1992; eff. July 15, 1992. **Repealed:** New Rule of same title, adopted. F. May. 10, 1994; eff. Mar. 30, 1994. **Amended:** F. Sept. 26, 1997; eff. Oct. 16, 1997. **Amended:** F. Sept. 29, 2000; eff. Oct. 19, 2000. **Amended:** F. June 8, 2001; eff. June 28, 2001. **Amended:** F. Dec. 10, 2002; eff. Dec. 30, 2002. **Amended:** F. Dec. 21, 2004; eff. Jan. 10, 2005. **Amended:** New title "Turbidity Sampling and Analytical Requirements. Amended." F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.21 Inorganic Chemical Sampling and Analytical Requirements. Amended.

(1) **CWS and NTNCWS Monitoring.** Community and nontransient, non-community water systems shall conduct monitoring to determine compliance with the maximum contaminant levels specified in Section 391-3-5-.18 in accordance with this section.

(2) **TNCWS Monitoring.** Transient, non-community water systems shall conduct monitoring to determine compliance with the nitrate and nitrite maximum contaminant levels in Section 391-3-5-.18 in accordance with this section.

(3) **Arsenic Monitoring.** The frequency of monitoring conducted to determine compliance with the maximum contaminant level for arsenic specified in Section 391-3-5-.18 shall be conducted as follows:

(a) Analyses for all community and non-transient, noncommunity water systems utilizing surface water sources shall be repeated at yearly intervals.

(b) Analyses for all community and non-transient, non-community water systems utilizing only ground water sources shall be repeated at three-year intervals.

(c) If the result of an analysis made pursuant to paragraph (3) of this Section indicates that the level of arsenic listed in paragraph (1) of Section 391-3-5-.18 exceeds the maximum contaminant level, the supplier of water shall report to the Division in writing within seven (7) days and initiate three additional analyses at the same sampling point within fourteen (14) days.

(d) When the average of four analyses made pursuant to paragraph (3)(c) of this Section, rounded to the same number of significant figures as the maximum contaminant level for the substance in question, exceeds the maximum contaminant level, the supplier of water shall notify the Division pursuant to Section 391-3-5-.30 and give notice to the public pursuant to Section 391-3-5-.32.

Monitoring after public notification shall be at a frequency designated by the Division and shall continue until the maximum contaminant level has not been exceeded in two successive samples or until a monitoring schedule as a condition to a permit, variance, exception or enforcement action shall become effective.

(e) If the four analyses are not made pursuant to paragraph (3)(c) of this section, the Division will use the analyses available to prepare compliance calculations pursuant to paragraph (3)(d) of this section.

(f) The system may apply to the Division for an arsenic waiver from the monitoring frequencies in paragraphs (3)(a) and (3)(b) of this section pursuant to paragraph (6)(b).

(4) **Inorganic Monitoring.** Monitoring for inorganic chemicals shall be conducted as follows:

(a) Groundwater systems shall take a minimum of one sample at every entry point to the distribution system which is representative of each well after treatment (hereafter called a sampling point) beginning in the compliance period starting January 1, 1993. The system shall take each sample at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant.

(b) Surface water systems shall take a minimum of one sample at every entry point to the distribution system after any application of treatment or in the distribution system at a point which is representative of each source after treatment (hereafter called a sampling point) beginning in the compliance period starting January 1, 1993. The system shall take each sample at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant. [NOTE: For purposes of this paragraph, surface water systems include systems with a combination of surface and ground sources.]

(c) If a system draws water from more than one source and the sources are combined before distribution, the system must sample

at an entry point to the distribution system during periods of normal operating conditions (i.e., when water is representative of all sources being used).

(d) The Division may reduce the total number of samples, which must be analyzed by allowing the use of compositing. Composite samples shall be collected and analyzed in accordance with 40 CFR, Part 141.23(a)(4). In the case of arsenic, if a PWS supplies water to one or more other PWSs and the interconnection justifies treating them as a single system for monitoring purposes, then the PWSs receiving the supplied water may have their arsenic monitoring requirements modified.

(5) **Asbestos Monitoring.** The frequency of monitoring conducted to determine compliance with the maximum contaminant level for asbestos specified in Section 391-3-5-.18 shall be conducted as follows:

(a) Community or non-transient, non-community water systems are required to monitor for asbestos during the first three-year compliance period of each nine-year compliance cycle beginning in the compliance period starting January 1, 1993.

(b) If the system believes it is not vulnerable to either asbestos contamination in its source water or due to corrosion of asbestoscement pipe, or both, it may apply to the Division for a waiver of the monitoring requirements in paragraph (5)(a) above. If the waiver is granted by the Division, the system is not required to monitor.

(c) The Division may grant a waiver based on a consideration of the following factors:

1. Potential asbestos contamination of the water source.

2. The use of asbestos-cement pipe for finished water distribution and the corrosive nature of the water.

(d) A waiver remains in effect until the completion of the threeyear compliance period. Systems not receiving a waiver must monitor in accordance with the provisions of paragraph (5)(a) of this section.

(e) A system vulnerable to asbestos contamination due solely to corrosion of asbestos-cement pipe shall take one sample at a tap served by asbestos-cement pipe and under conditions where asbestos contamination is most likely to occur.

(f) A system vulnerable to asbestos contamination due solely to source water shall monitor in accordance with the provision of paragraph (4) of this section.

(g) A system vulnerable to asbestos contamination due both to its source water supply and corrosion of asbestos-cement pipe shall take one sample at a tap served by asbestos-cement pipe and under conditions where asbestos contamination is most likely to occur.

(h) A system which exceeds the maximum contaminant levels as determined in Section 391-3-5-.21(12) shall monitor quarterly beginning in the next quarter after the violation occurred.

(i) The Division may decrease the quarterly monitoring requirement to the frequency specified in paragraph (5)(a) of this section provided the Division has determined that the system is reliably and consistently below the maximum contaminant level. In no case can the Division make this determination unless a groundwater system takes a minimum of two quarterly samples and a surface (or combined surface/ground) water system takes a minimum of four quarterly samples.

(j) If monitoring data collected after January 1, 1990 are generally consistent with the requirements of Section 391-3-5-.21(5) then the Division may allow systems to use that data to satisfy the monitoring requirement for the initial compliance period beginning January 1, 1993.

(6) **Other Inorganics Monitoring.** The frequency of monitoring conducted to determine compliance with the maximum contaminant levels in Section 391-3-5-.18 for antimony, arsenic, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium and thallium shall be as follows:

(a) Groundwater systems shall take one sample at each sampling point during each compliance period beginning in the compliance period starting January 1, 1993. Surface water systems (or combined surface/ground) shall take one sample annually at each sampling point beginning January 1, 1993.

(b) The system may apply to the Division for a waiver from the monitoring frequencies specified in paragraph (3)(a), (3)(b) and (6)(a) of this section.

(c) A condition of the waiver shall require that a system shall take a minimum of one sample while the waiver is effective. The term during which the waiver is effective shall not exceed one compliance cycle (i.e., nine years).

(d) The Division may grant a waiver provided surface water systems have monitored annually for at least three years and groundwater systems have conducted a minimum of three rounds of monitoring. (At least one sample shall have been taken since January 1, 1990.) Both surface and groundwater systems shall demonstrate that all previous analytical results were less than the maximum contaminant level. Systems that use a new water source are not eligible for a waiver until three rounds of monitoring from the new source have been completed. In the case of arsenic, new water systems are not eligible for a waiver until three rounds of monitoring have been completed.

(e) In determining the appropriate reduced monitoring frequency, the Division shall consider:

1. Reported concentrations from all previous monitoring;

2. The degree of variation in reported concentrations; and

3. Other factors which may affect contaminant concentrations such as changes in groundwater pumping rates, changes in the system's configuration, changes in the system's operating procedures, or changes in stream flows or characteristics.

(f) A decision by the Division to grant a waiver shall be made in writing and shall set forth the basis for the determination. The

determination may be initiated by the Division or upon an application by the public water system. The public water system shall specify the basis for its request. The Division shall review and, where appropriate, revise its determination of the appropriate monitoring frequency when the system submits new monitoring data or when other data relevant to the system's appropriate monitoring frequency become available.

(g) Systems which exceed the maximum contaminant levels as calculated in paragraph (3)(d) and (12) of this section shall monitor quarterly beginning in the next quarter after the violation occurred.

(h) The Division may decrease the quarterly monitoring requirement to the frequencies specified in paragraph (3)(a), (3)(b), (6)(a) and (6)(b) of this section provided it has determined that the system is reliably and consistently below the maximum contaminant level. In no case can the Division make this determination unless a groundwater system takes a minimum of two quarterly samples and a surface water system takes a minimum of four quarterly samples.

(7) **Nitrate Monitoring.** The frequency of monitoring for nitrate shall be as follows: All public water systems (community; non-transient, non-community; and transient, non-community systems) shall monitor to determine compliance with the maximum contaminant level for nitrate in Rule 391-3-5-.18.

(a) Community and non-transient, non-community water systems served by groundwater systems shall monitor annually beginning January 1, 1993; systems served by surface water shall monitor quarterly beginning January 1, 1993.

(b) For community and non-transient, non-community water systems, the repeat monitoring frequency for ground water systems shall be quarterly for at least one year following any one sample in which the concentration is greater than or equal to fifty percent (\geq 50%) of the MCL. The Division may allow a groundwater system to reduce the sampling frequency to annually after four consecutive quarterly samples are reliably and consistently less than the MCL.

(c) For community and non-transient, non-community water systems, the Division may allow a surface water system to reduce the sampling frequency to annually if all analytical results from four consecutive quarters are less than fifty percent (<50%) of the MCL. A surface water system shall return to quarterly monitoring if any one sample is greater than or equal to fifty percent (\geq 50%) of the MCL.

(d) Each transient non-community water system shall monitor annually beginning January 1, 1993.

(e) After the initial round of quarterly sampling is completed, each community and non-transient non-community system which is monitoring annually shall take subsequent samples during the quarter(s) which previously resulted in the highest analytical result.

(8) **Nitrite Monitoring.** The frequency of monitoring for nitrite shall be as follows: All public water systems (community; non-transient, non-community; and transient, non-community systems) shall monitor to determine compliance with the maximum contaminant level for nitrite in Rule 391-3-5-.18.

(a) All public water systems shall take one sample at each sampling point in the compliance period beginning January 1, 1993 and ending December 31, 1995.

(b) After the initial sample, systems where an analytical result for nitrite is less than fifty percent (<50%) of the MCL shall monitor at the frequency specified by the Division.

(c) For community, non-transient, non-community, and transient non-community water systems, the repeat monitoring frequency for any water system shall be quarterly for at least one year following any one sample in which the concentration is greater than or equal to fifty percent (\geq 50%) of the MCL. The Division may allow a system to reduce the sampling frequency to annually after determining the system is reliably and consistently less than the MCL.

(d) Systems which are monitoring annually shall take each

subsequent sample during the quarter(s) which previously resulted in the highest analytical result.

(9) **Confirmation samples.**

(a) Where the results of sampling for antimony, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium, or thallium indicate an exceedance of the maximum contaminant level, the Division may require that one additional sample be collected as soon as possible after the initial sample was taken (but not to exceed two weeks) at the same sampling point.

(b) Where nitrate or nitrite sample results indicate an exceedance of the maximum contaminant level, the system shall take a confirmation sample within 24 hours of the system's receipt of notification of the analytical results of the first sample. Systems unable to comply with the 24-hour sampling requirement must immediately notify the customers served by the area served by the public water system in accordance with Rule 391-3-5-.32. Systems exercising this option must take and analyze a confirmation sample within two weeks of notification of the analytical results of the first sample.

(c) If a Division-required confirmation sample is taken for any contaminant, then the results of the initial and confirmation sample shall be averaged. The resulting average shall be used to determine the system's compliance in accordance with paragraph 12 of the section.

(10) Increased Frequency of Monitoring. The Division may require more frequent monitoring than specified in paragraphs (5), (6), (7), and (8) of this section or may require confirmation samples for positive and negative results at its discretion.

(11) **Request for Increased Monitoring Frequency.** Systems may apply to the Division to conduct more frequent monitoring than the minimum monitoring frequencies specified in this section.

(12) **Compliance Based on Analytical Results.** Compliance with Rule 391-3-5-.18 (as appropriate) shall be determined based on the

analytical result(s) obtained at each sampling point.

(a) For systems which are conducting monitoring at a frequency greater than annual, compliance with the maximum contaminant levels for antimony, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium and thallium is determined by a running annual average at each sampling point. If the average at any sampling point is greater than the MCL, then the system is out of compliance. If any single sample would cause the annual average to be exceeded, then the system is out of compliance immediately. Any sample below the detection limit shall be calculated at zero for the purpose of determining the annual average.

(b) For systems which are monitoring annually, or less frequently, the system is out of compliance with the maximum contaminant levels for antimony, asbestos, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium and thallium if the level of a contaminant at any sampling point is greater than the MCL. If a confirmation sample is required by the Division, the determination of compliance will be based on the average of the two samples.

(c) Compliance with the maximum contaminant levels for nitrate and nitrite is determined based on one sample if the levels of these contaminants are below the MCLs. If the levels of nitrate and/or nitrite exceed the MCLs in the initial sample, a confirmation sample is required in accordance with paragraph (9) of this section, and compliance shall be determined based on the average of the initial and confirmation samples.

(d) If a public water system has a distribution system separable from other parts of the distribution system with no interconnections, the Division may allow the system to give public notice to only the area served by that portion of the system which is out of compliance.

(13) **Monitor at Time Designated by Division.** Each public water system shall monitor at the time designated by the Division

during each compliance period.

(14) **Analyses to Determine Compliance.** All analyses conducted to determine compliance with paragraph (1)(a) of Rule 391- 3-5-.18 and this Section shall be in accordance with 40 CFR, Part 141.23(k). Arsenic sampling results shall be reported to the nearest 0.001 mg/L.

(15) **Certified Laboratories.** Analysis under this section shall only be conducted by laboratories that have received approval by EPA fulfilling the requirements listed in 40 CFR, Part 141.23(k)(3) or have received certification from the Division. Laboratories may conduct sample analysis under provisional certification until January 1, 1996.

(16) **Compliance and Enforcement.** The Division has the authority to determine compliance or initiate enforcement action based upon analytical results and other information compiled by their sanctioned representatives or agencies.

(17) **Treatment to Achieve Compliance.** The best technology, treatment technique, or other means available for achieving compliance with the maximum contaminant level for inorganic contaminants identified in Section 391-3-5-.18(1)(a) shall be in accordance with 40 CFR, Part 141.62(c).

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Inorganic Chemical Sampling and Analytical Requirements" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5- .47. **Amended:** F. July 15, 1983; eff. Aug. 4, 1983. **Repealed:** New Rule of same title adopted. F. May 12, 1989; eff. June 1, 1989. **Amended:** F. Dec. 4, 1990; eff. Dec. 24, 1990. **Repealed:** New Rule of same title adopted. F. May 12, 1989; eff. June 1, 1989. **Amended:** F. June 25, 1992; eff. July 15, 1992. **Repealed:** New Rule of same title adopted F. Mar. 10, 1994; eff. Mar. 30, 1994. **Amended:** F. Sept. 26, 1997; eff. Oct. 16, 1997. **Amended:** F. Dec. 10, 2002; eff. Dec. 30, 2002. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.22 Organic Chemical Sampling and Analytical Requirements. Amended.

(1) **Organic Monitoring.** Beginning on January 1, 1993, analysis of the contaminants listed in Section 391-3-5- .18(2)(b)1-21 for the purpose of determining compliance with the maximum contaminant level shall be conducted as follows:

(a) Groundwater systems shall take a minimum of one sample at every entry point to the distribution system which is representative of each well after treatment (hereafter called a sampling point). Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source, treatment plant, or within the distribution system.

(b) Surface water systems (or combined surface/ground) shall take a minimum of one sample at points in the distribution system that are representative of each source or at each entry point to the distribution system after treatment (hereafter called a sampling point). Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source, treatment plant, or within the distribution system.

(c) If the system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions (i.e., when water representative of all sources is being used).

(d) Each community and non-transient non-community water system shall take four consecutive quarterly samples for each contaminant listed in Section 391-3-5-.18(2)(b)2-21 during each compliance period.

(e) If the initial monitoring for contaminants listed in Section 391-3-5-.18(2)(b)1-8 and the monitoring for the contaminants listed in Section 391-3-5-.18(2)(b)9-21 as allowed in paragraph (1)(q) of this section has been completed by December 31, 1992

and the system did not detect any contaminant listed in Section 391-3-5-.18(2)(b)1-21, then each ground and surface water system shall take one sample annually.

(f) After a minimum of three years of annual sampling, the Division may allow groundwater systems with no previous detection of any contaminant listed in Section 391-3-5-.18(2)(b) to take one sample during each compliance period.

(g) Each community and non-transient groundwater system which does not detect a contaminant listed in Section 391-3-5-.18(2)(b)1-21 may apply to the Division for a waiver from the requirement of paragraph (1)(e) and (1)(f) of this section after completing the initial monitoring. (For the purposes of this section, detection is defined as >0.0005 mg/L.) A waiver shall be effective for no more than six years (two compliance periods). The Division may also issue waivers to small systems for the initial round of monitoring for 1,2,4-trichlorobenzene.

(h) The Division may grant a waiver after evaluating the factors in accordance with 40 CFR, Part 141.24(f)(8-9).

(i) Each community and non-transient surface water system which does not detect a contaminant listed in Section 391-3-5-.18(2)(b)1-21 may apply to the Division for a waiver from the requirements of (1)(e) of this section after completing the initial monitoring. Composite samples from a maximum of five sampling points are allowed, provided that the detection limit of the method used for analysis is less than one-fifth of the MCL. Systems meeting this criteria must be determined by the Division to be nonvulnerable based on a vulnerability assessment during each compliance period. Each system receiving a waiver shall sample at the frequency specified by the Division (if any).

(j) If a contaminant listed in Section 391-3-5-.18(2)(b)2-21 is detected at a level exceeding 0.0005 mg/L in any sample, then:

1. The system must monitor quarterly at each sampling point which resulted in a detection.

2. The Division may decrease the quarterly monitoring requirements specified in paragraph (1)(j)(1) of this section; provided it has determined that the system is reliably and consistently below the maximum contaminant level. In no case shall the Division make this determination unless a groundwater system takes a minimum of two quarterly samples and a surface water system takes a minimum of four quarterly samples.

3. If the Division determines that the system is reliably and consistently below the MCL, the Division may allow the system to monitor annually. Systems which monitor annually must monitor during the quarter(s) which previously yielded the highest analytical result.

4. Systems which have three consecutive annual samples with no detection of a contaminant may apply to the Division for a waiver as specified in paragraph (1)(g) of this section.

5. Groundwater systems which have detected one or more of the following two-carbon organic compounds: trichloroethylene, tetrachloroethylene, 1,2-dichloroethane, 1,1,1-trichloroethane, cis-1,2-dichloroethylene, trans-1,2-dichloroethylene, or 1,1-dichloroethylene shall monitor quarterly for vinyl chloride. A vinyl chloride sample shall be taken at each sampling point at which one or more of the two-carbon organic compounds was detected. If the results of the first analysis do not detect vinyl chloride, the Division may reduce the quarterly monitoring frequency of vinyl chloride monitoring to one sample during each compliance period. Surface water systems are required to monitor for vinyl chloride as specified by the Division.

(k) Systems which violate the requirements of Section 391-3-5-.18(2)(b)1-21 as determined by paragraph (l)(n) of this section must monitor quarterly. After a minimum of four quarterly samples which show the system is in compliance as specified in paragraph (l)(n) of this section, and the Division determines that the system is reliably and consistently below the maximum contaminant level, the system may monitor at the frequency and time specified in

paragraph (1)(j)3 of this section.

(1) The Division may require a confirmation sample for positive or negative results. If a confirmation sample is required by the Division, the result must be averaged with the first sampling result and the average is used for the compliance determination as specified by paragraph (1)(n) of this section. The Division has the discretion to delete results of obvious sampling errors from this calculation.

(m) The Division may reduce the total number of samples a system must analyze by allowing the use of compositing. Composite sampling and their analysis shall be in accordance with 40 CFR, Part 141.24(f)(14).

(n) Compliance with Rule 391-3-5-.18(2)(b)1-21 shall be determined based on the analytical results obtained at each sampling point.

1. For systems which are conducting monitoring at a frequency greater than annual, compliance is determined by a running annual average of all samples taken at each sampling point. If the annual average of any sampling point is greater than the MCL, then the system is out of compliance. If the initial sample or a subsequent sample would cause the annual average to be exceeded, then the system is out of compliance immediately.

2. If monitoring is conducted annually, or less frequently, the system is out of compliance if the level of a contaminant at any sampling point is greater than the MCL. If a confirmation sample is required by the Division, the determination of compliance will be based on the average of two samples.

3. If a public water system has a distribution system separable from other parts of the distribution system with no interconnections, the Division may allow the system to give public notice to only that area served by that portion of the system which is out of compliance.

(o) Analysis for the contaminants listed in Rule 391-3-5-

.18(2)(b)1-21 shall be conducted in accordance with 40 CFR, Part 141.24(f)(17). These methods are contained in Methods for the Determination of Organic Compounds in Drinking Water, EPA/600/4-88/039, December 1988 and are available from the National Technical Information Service (NTIS) NTIS PB91-231480 and PB91-146027, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161.

(p) Analysis under this section shall only be conducted by laboratories certified by the Division or laboratories certified by EPA in accordance with conditions listed in 40 CFR, Part 141.24(f)(17).

(q) The Division may allow the use of monitoring data collected after January 1, 1998 required under section 1445 of the Public Health Service Act, as amended by the Federal Safe Drinking Water Act, Public Law 93-523, for purposes of initial monitoring compliance. If the data are generally consistent with the other requirements in this section, the Division may use these data (i.e., a single sample rather than four quarterly samples) to satisfy the initial monitoring requirement of paragraph (l)(d) of this section. Systems which use grandfathered samples and did not detect any contaminant listed in Rule 391-3-5-.18(2)(b)2-21 shall begin monitoring annually in accordance with paragraph 1(e) of this section.

(r) The Division may increase required monitoring where necessary to detect variations within the system.

(s) Each certified laboratory must determine the method detection limit (MDL), as defined in 40 CFR, Part 136 appendix B, at which it is capable of detecting VOCs. The acceptable MDL is 0.0005 mg/L. This concentration is the detection concentration for purposes of this section.

(t) Each public water system shall monitor at the time designated by the Division within each compliance period.

(2) Initial Organic Monitoring. For systems in operation before

January 1, 1993, for purposes of initial monitoring, analysis of the contaminants listed in Rule 391-3-5-.18(2)(b)1-8 for purposes of determining compliance with the maximum contaminant levels shall be conducted as follows:

(a) Ground-water systems shall sample at points of entry to the distribution system representative of each well after any application of treatment. Sampling must be conducted at the same location(s) or more representative location(s) every three months for one year except as provided in paragraph (2)(h) of this section.

(b) Surface water systems shall sample at points in the distribution system representative of each source or at entry points to the system after any application of treatment. Surface water systems must sample each source every three months except as provided in paragraph (2)(h) of this section. Sampling must be conducted at the same location or a more representative location each quarter.

(c) If the system draws water from more than one source and sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions.

(d) All community water systems and non-transient, noncommunity water systems serving more than 10,000 people shall analyze all distribution or entry-point samples, as appropriate, representing all source waters beginning no later than January 1, 1988. All community water systems and non-transient, noncommunity water systems serving from 3,300 to 10,000 people shall analyze all distribution or entry point samples, as required in this paragraph (2), representing source waters no later than January 1, 1989. All other community and non-transient, non-community water systems shall analyze distribution or entry-point samples as required in this paragraph (2), representing all source waters beginning no later than January 1, 1991.

(e) The Division may require confirmation samples for positive or negative results. If a confirmation sample)s) is required by the

Division, then the sample results(s) should be averaged with the first sampling result and used for compliance determination in accordance with paragraph (2)(i) of this section. The Division has the discretion to delete results of obvious sampling errors from this calculation.

(f) Analysis for vinyl chloride is required only for ground water systems that have detected one or more of the following twocarbon organic compounds: Trichloroethylene, tetrachloroethylene, 1,2-dichloroethane, 1,1,1-trichloroethane, cis-1,2-dichloroethylene, trans-1,2-dichloroethylene, or 1,1-dichloroethylene. The analysis for vinyl chloride is required at each distribution or entry point at which one or more of the two-carbon organic compounds were found. If the first analysis does not detect vinyl chloride, the Division may reduce the frequency of vinyl chloride monitoring to once every three years for that sample location or other sample locations that are more representative of the same source. Surface water systems may be required to analyze for vinyl chloride at the discretion of the Division.

(g) The Division may allow compositing of up to five samples from one or more public water systems.

(h) The Division may reduce the monitoring frequency specified in paragraphs (2)(a) and (b) of this section as explained in this paragraph.

(i) Compliance with Rule 391-3-5-.18(2)(b) shall be determined based on the results of running annual average of quarterly sampling for each sampling location. If one location's average is greater than the MCL, then the system shall be deemed to be out of compliance. If a public water system has a distribution system separable from other parts of the distribution system with no interconnections, only that part of the system that exceeds any MCL as specified in Rule 391-3-5-.18(2)(b) will be deemed out of compliance. The Division may reduce the public notice requirement to that portion of the system which is out of compliance. If any single sample result would cause the annual average to be exceeded, then the system shall be deemed to be out of compliance immediately. For systems that only take one sample per location because no VOCs were detected, compliance shall be based on that one sample.

(j) Analysis under this section shall only be conducted by laboratories certified by the Division or have been certified by the EPA.

(k) The Division may allow the use of monitoring data collected after January 1, 1983, for purposes of monitoring compliance. If the data is consistent with other requirements of this section. The Division may use that data to represent the initial monitoring if the system is determined by the Division not to be vulnerable under the requirements of this section. In addition, the result of EPA's Ground Water Supply Survey may be used in a similar manner for systems supplied by a single well.

(1) The Division may increase required monitoring where necessary to detect variations within the system.

(m) The Division may determine compliance or initiate enforcement action based on analytical results or other information compiled by their sanctioned representatives and agencies.

(n) Each certified laboratory must determine the method detection limit (MDL), as defined in 40 CFR, Part 136 appendix B, at which it is capable of detecting VOCs. The acceptable MDL is 0.0005 mg/L. This concentration is the detection level for purposes of paragraphs 391-3-5-.22(2)(e), (f), and (g) of this section.

(3) **Ongoing Organic Monitoring.** Analysis of the contaminants listed in Rule 391-3-5-.18(2)(a) for the purposes of determining compliance with the maximum contaminant level shall be conducted as follows:

(a) Groundwater systems shall take a minimum of one sample at every entry point to the distribution system which is representative of each well after treatment (hereafter called a sampling point). Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant.

(b) Surface water systems shall take a minimum of one sample at points in the distribution system that are representative of each source or at each entry point to the distribution system after treatment (hereafter called a sampling point). Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant. [Note: For purposes of this paragraph, surface water systems include systems with a combination of surface and ground sources.]

(c) If the system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions (i.e., when water representative of all sources is being used).

(d) Monitoring frequency:

1. Each community and non-transient non-community water system shall take four consecutive quarterly samples for each contaminant listed in Rule 391-3-5-.18(2)(a) during each compliance period beginning with the compliance period starting January 1, 1993.

2. Systems serving more than 3,300 persons which do not detect a contaminant in the initial compliance period, may reduce the sampling frequency to a minimum of two quarterly samples in one year during each repeat compliance period.

3. Systems serving less than or equal to 3,300 persons which do not detect a contaminant in the initial compliance period may reduce the sampling frequency to a minimum of one sample during each repeat compliance period.

(e) Each community and non-transient water system may apply to the Division for a waiver from the requirement of paragraph (3)(d) of this section. A system must reapply for a waiver for each compliance period.

(f) The Division may grant a waiver after evaluating the factors in accordance with 40 CFR, Part 141.24(h)(6).

(g) If an organic contaminant listed in Rule 391-3-5-.18(2)(a) is detected (as defined by paragraph (3)(q) of this section) in any sample, then:

1. Each system must monitor quarterly at each sampling point which resulted in a detection.

2. The Division may decrease the quarterly monitoring requirement specified in paragraph (3)(g)1 of this section provided it has determined that the system is reliably and consistently below the maximum contaminant level. In no case shall the Division make this determination unless a groundwater system takes a minimum of two quarterly samples and a surface water system takes a minimum of four quarterly samples.

3. After the Division determines the system is reliably and consistently below the maximum contaminant level the Division may allow the system to monitor annually. Systems which monitor annually must monitor during the quarter that previously yielded the highest analytical result.

4. Systems which have three (3) consecutive annual samples with no detection of a contaminant may apply to the Division for a waiver as specified in paragraph (3)(f) of this section.

5. If monitoring results in detection of one or more of certain related contaminants (aldicarb, aldicarb sulfone, aldicarb sulfoxide and heptachlor, heptachlor epoxide), then subsequent monitoring shall analyze for all related contaminants.

(h) Systems which violate the requirements of Rule 391-3-5-.18(2)(a) as determined by paragraph (3)(k) of this section must monitor quarterly. After a minimum of four quarterly samples show the system is in compliance and the Division determines the system is reliably and consistently below the MCL, as specified in paragraph (3)(k) of this section, the system shall monitor at the

frequency specified in paragraph (3)(g)3 of this section.

(i) The Division may require a confirmation sample for positive or negative results. If a confirmation sample is required by the Division, the result must be averaged with the first sampling result and the average used for the compliance determination as specified by paragraph (3)(k) of this section. The Division has the discretion to delete results of obvious sampling errors from this calculation.

(j) The Division may reduce the total number of samples a system must analyze by allowing the use of compositing. Composite sampling and their analysis shall be in accordance with 40 CFR, Part 141.24(h)(10).

(k) Compliance with Section 391-3-5-.18(2)(a) shall be determined based on the analytical results obtained at each sampling point.

1. For systems which are conducting monitoring at a frequency greater than annual, compliance is determined by a running annual average of all samples taken at each sampling point. If the annual average of any sampling point is greater than the MCL, then the system is out of compliance. If the initial sample or a subsequent sample would cause the annual average to be exceeded, then the system is out of compliance immediately. Any samples below the detection limit shall be calculated as zero for purposes of determining the annual average.

2. If monitoring is conducted annually, or less frequently, the system is out of compliance if the level of a contaminant at any sampling point is greater than the MCL. If a confirmation sample is required by the Division, the determination of compliance will be based on the average of two samples.

3. If a public water system has a distribution system separable from other parts of the distribution system with no interconnections, the Division may allow the system to give public notice to only that portion of the system which is out of compliance. (l) Analysis for the contaminants listed in Section 391-3-5-.18(2)(a) shall be conducted in accordance with 40 CFR, Part 141.24(h)(12-13). These methods are contained in "Methods for the Determination of Organic Compounds in Drinking Water", ORD Publications, CERI, EPA/600/4-88/039, December 1988.

(m) If monitoring data collected after January 1, 1990, are generally consistent with the requirements of Section 391-3-5-.22(3), then the Division may allow systems to use that data to satisfy the monitoring requirement for the initial compliance period beginning January 1, 1993.

(n) The Division may increase the required monitoring frequency, where necessary, to detect variations within the system (e.g., fluctuations in concentration due to seasonal use, changes in water source).

(o) The Division has the authority to determine compliance or initiate enforcement action based upon analytical results and other information compiled by their sanctioned representatives and agencies.

(p) Each public water system shall monitor at the time designated by the Division within each compliance period.

(q) Detection limits for contaminants used in this Section shall be in accordance with 40 CFR, Part 141.24(h)(18).

(r) Analysis under this section shall conform to paragraph (1) of Section 391-3-5-.29.

(s) The best technology, treatment technique, or other means available for achieving compliance with the maximum contaminant level for organic contaminants in Section 391-3-5-.18(2)(a) and (2)(b) shall be in accordance with 40 CFR, Part 141.61(b).

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Organic Chemical Sampling and Analytical Requirements" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Amended:** F. July 15, 1983; eff. Aug. 4, 1983. **Repealed:** New Rule of same title adopted. F. May 12, 1989; eff.

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June 1, 1989. **Amended:** F. Dec. 4, 1990; eff. Dec. 24, 1990. **Repealed:** New Rule of same title adopted. F. June 25, 1992; eff. July 15, 1992. **Repealed:** New Rule, same title, adopted F. Mar. 10, 1994; eff. Mar. 30, 1994. **Amended:** F. Sept. 26, 1997; eff. Oct. 16, 1997. **Amended:** F. June 8, 2001; eff. June 28, 2001. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.23 Coliform Sampling. Amended.

(1) **Routine Coliform Monitoring.**

(a) Public water systems must collect total coliform samples at sites which are representative of water throughout the distribution system according to a written sample siting plan. These plans are subject to Division review and revision.

(b) The minimum residential population of a community water system shall be determined by a mathematical calculation of the total number of active residential service connections multiplied by Georgia's average population per household, as published in the most recent Federal Census Bureau Statistics. Multiple residential units served by a single connection (master meter) shall be included in the determination of population for a water system. The minimum monitoring frequency for total coliforms for community water systems is based on the population served by the system, as follows:

Population Served	Minimum Number of Samples per Month
25 to 1,000 ¹	1
1,001 to 2,500	2
2,501 to 3,300	3
3,301 to 4,100	4
4,101 to 4,900	5
4,901 to 5,800	6
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
17,201 to 21,500	20

Population Served	Minimum Number of Samples per Month
21,501 to 25,000	25
25,001 to 33,000	30
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

¹Includes public water systems which have at least 15 service connections, but serve fewer than 25 persons.

If a community water system serving 25 to 1,000 persons has no history of total coliform contamination in its current configuration and a sanitary survey conducted in the past five years shows that the system is supplied solely by a protected ground water source and is free of sanitary defects, the Division may reduce the monitoring frequency specified above, except that in no case shall it be reduced to less than one sample per quarter. (c) The monitoring frequency for total coliform for noncommunity water systems is as follows:

1. A non-community water system using only ground water (except ground water under the direct influence of surface water) and serving 1,000 persons or fewer must monitor each calendar quarter that the system provides water to the public, except that the Division may adjust this monitoring frequency in writing, if a sanitary survey shows that the system is free of sanitary defects.

2. A non-community water system using only ground water (except ground water under the direct influence of surface water) and serving more than 1,000 persons during any month must monitor at the same frequency as a like-sized community water system, except that the Division may adjust this monitoring frequency, in writing for any month the system serves 1,000 persons or fewer.

3. A non-community water system using surface water, in total or in part, must monitor at the same frequency as a like-sized community water system, regardless of the number of persons it serves.

4. A non-community water system using ground water under the direct influence of surface water must monitor at the same frequency as a like-sized community water system. The system must begin monitoring at this frequency beginning six months after the Division determines that the ground water is under the direct influence of surface water.

(d) The public water system must collect samples at regular time intervals throughout the month, except that a system which uses only ground water (except ground water under the direct influence of surface water), and serves 4,900 persons or fewer, may collect all required samples on a single day if they are taken from different sites.

(e) Special purpose samples, such as those taken to determine whether disinfection practices are sufficient following pipe

placement, replacement, or repair, shall not be used to determine compliance with the MCL for total coliforms. Repeat samples are not considered special purpose samples, and must be used to determine compliance with the MCL for total coliforms.

(2) **Repeat Coliform Monitoring.**

(a) If a routine sample is total coliform-positive, the public water system must collect a set of repeat samples within 24 hours of being notified of the positive result. A system which collects more than one routine sample per month must collect no fewer than three repeat samples for each total coliform-positive sample found. A system which normally collects one routine sample per month or fewer must collect no fewer than four repeat samples for each total coliform-positive sample found. The Division may extend the 24hour limit on a case-by-case basis if the system has a logistical problem in collecting the repeat samples within 24 hours that is beyond its control.

(b) The system must collect at least one repeat sample from the sampling tap where the original total coliform-positive sample was taken, and at least one repeat sample at a tap within five service connections upstream and at least one repeat sample at a tap within five service connections downstream of the original sampling site. If a total coliform-positive sample is at the end of the distribution system, or one away from the end of the distribution system, the Division may waive the requirement to collect at least one repeat sample upstream or downstream of the original sampling site.

(c) The system must collect all repeat samples on the same day, except that the Division may allow a system with a single service connection to collect the required set of repeat samples over a four-day period.

(d) If one or more repeat samples in the set is total coliformpositive, the public water system must collect an additional set of repeat samples in the manner specified in this section. The additional samples must be collected within 24 hours of being notified of the positive result, unless the Division extends the limit as provided in this section. The system must repeat this process until either total coliforms are not detected in one complete set of repeat samples or the system determines that the MCL for total coliforms has been exceeded and notifies the Division.

(e) If a system collecting fewer than five routine samples per month has one or more total coliform-positive samples and the Division does not invalidate the sample(s), it must collect at least five routine samples during the next month the system provides water to the public, except that the Division may waive this requirement if the conditions specified below are met. The Division cannot waive the requirement for a system to collect repeat samples.

1. The Division may waive the requirement to collect five routine samples the next month the system provides water to the public if the Division, or an agent approved by the Division, performs a site visit before the end of the next month the system provides water to the public. Although a sanitary survey need not be performed, the site visit must be sufficiently detailed to allow the Division to determine whether additional monitoring and/or any corrective action is needed. The Division cannot approve an employee of the system to perform this site visit, even if the employee is an agent approved by the Division to perform sanitary surveys.

2. The Division may waive the requirement to collect five routine samples the next month the system provides water to the public if the Division has determined why the sample was total coliform-positive and establishes that the system has corrected the problem or will correct the problem before the end of the next month the system serves water to the public. The Division cannot waive the requirement to collect five routine samples the next month the system provides water to the public solely on the grounds that all repeat samples are total coliform-negative. Under this paragraph, a system must still take at least one routine sample before the end of the next month it serves water to the public and use it to determine compliance with the MCL for total coliforms, unless the Division has determined that the system has corrected the contamination problem before the system took the set of repeat samples required above, and all repeat samples were total coliform-negative.

(f) After a system collects a routine sample and before it learns the results of the analysis of that sample, if it collects another routine sample(s) from within five adjacent service connections of the initial sample, and the initial sample, after analysis, is found to contain total colliforms, then the system may count the subsequent sample(s) as a repeat sample instead of as a routine sample.

(g) Results of all routine and repeat samples not invalidated by the Division must be included in determining compliance with the MCL for total coliforms.

(3) **Invalidation of Total Coliform Samples.** A total coliformpositive sample invalidated under this paragraph does not count towards meeting the minimum monitoring requirements of this Section.

(a) The Division may invalidate a total coliform-positive sample only if the conditions that follow below are met:

1. The laboratory establishes that improper sample analysis caused the total coliform-positive result.

2. The Division, on the basis of the results of repeat samples collected as required by this Section, determines that the total coliform-positive sample resulted from a domestic or other nondistribution system plumbing problem. The Division cannot invalidate a sample on the basis of repeat sample results unless all repeat sample(s) collected at the same tap as the original total coliform-positive sample are also total coliform-positive, and all repeat samples collected within five service connections of the original tap are total coliform-negative (e.g., the Division cannot invalidate a total coliform-positive samples are total coliform-negative, or if the public water system has only one service connection).

3. The Division has substantial grounds to believe that a total coliform-positive result is due to a circumstance or condition

which does not reflect water quality in the distribution system. In this case, the system must still collect all repeat samples required under this Section, and use them to determine compliance with the MCL for total coliforms. The Division may not invalidate a total coliform-positive sample solely on the grounds that all repeat samples are total coliform-negative.

(b) A laboratory must invalidate a total coliform sample (unless total coliforms are detected) if the sample produces a turbid culture in the absence of gas production using an analytical method where gas formation is examined (e.g., the Multiple-Tube Fermentation Technique), produces a turbid culture in the absence of an acid reaction in the Presence-Absence (P-A) Coliform Test, or exhibits confluent growth or produces colonies too numerous to count with an analytical method using a membrane filter (e.g., Membrane Filter Technique). If a laboratory invalidates a sample because of such interference, the system must collect another sample from the same location as the original sample within 24 hours of being notified of the interference problem, and have it analyzed for the presence of total coliforms. The system must continue to re-sample within 24 hours and have the samples analyzed until it obtains a valid result. The Division may waive the 24-hour time limit on a case-by-case basis.

(4) Sanitary Surveys.

(a) All ground water systems must undergo sanitary surveys no less frequently than every three years for community systems, except as provided in paragraph (b) of this section, and no less frequently than every five years for non-community systems. The initial sanitary survey for each community ground water system must be conducted by December 31, 2012, unless the system meets requirements of paragraph (b) of this section.

(b) For community ground water systems determined by the Division to have outstanding performance based on prior sanitary surveys, or that provide at least 4-log (99.99%) treatment of viruses (using inactivation, removal, or a combination of the two)

subsequent sanitary surveys may be conducted no less than every five years. The initial sanitary survey for community systems that meet these requirements and for each non-community system must be conducted by December 31, 2014.

(c) All surface water systems (including groundwater under the influence) must undergo sanitary surveys no less frequently than every three years for community systems and no less frequently than every five years for non-community systems. For community systems determined by the Division to have outstanding performance based on prior sanitary surveys, subsequent sanitary surveys may be conducted no less than every five years.

(d) Sanitary surveys must be performed by the Division or an agent approved by the Division. The system is responsible for ensuring the survey takes place.

(5) Fecal Coliforms - *Escherichia coli* (E. coli) Testing.

(a) If any routine or repeat sample is total coliform-positive, the system must analyze that total coliform-positive culture medium to determine if fecal coliforms are present, except that the system may test for *E. coli* in lieu of fecal coliforms. If fecal coliforms or *E. coli* are present, the system must notify the Division by the end of the day when the system is notified of the test result, unless the system is notified of the result after the Division office is closed, in which case the system must notify the Division before the end of the next business day.

(b) The Division has the discretion to allow a public water system, on a case-by-case basis, to forego fecal coliform or *E. coli* testing on a total coliform-positive sample if that system assumes that the total coliform-positive sample is fecal coliform-positive or *E. coli*-positive. Accordingly, the system must notify the Division as specified in this Section and the MCL applies.

(6) Analytical Methodology.

(a) The standard sample volume required for total coliform analysis, regardless of analytical method used, is 100 mL.

(b) Public water systems need only determine the presence or absence of total coliforms; a determination of total coliform density is not required.

(c) Public water systems must conduct total coliform analyses in accordance with 40 CFR 141.21.

(d) Public water systems must conduct fecal coliform analyses in accordance with 40 CFR 141.21.

(7) **Response to Violation.**

(a) A public water system which has exceeded the MCL for total coliforms must report the violation to the Division no later than the end of the next business day after it learns of the violation, and notify the public in accordance with this chapter.

(b) A public water system which has failed to comply with a coliform monitoring requirement, including the sanitary survey requirement, must report the monitoring violation to the Division within ten days after the system discovers the violation, and notify the public in accordance with this chapter.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Alternative Analytical Techniques" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Repealed:** New Rule entitled "Microbiological Contaminant Sampling and Analytical Requirements" adopted. F. May 12, 1989; eff. June 1, 1989. **Repealed:** New Rule entitled "Coliform Sampling" adopted. F. Dec. 4, 1990; eff. Dec. 24, 1990. **Amended:** F. Sept. 26, 1997; eff. Oct. 16, 1997. **Amended:** F. June 8, 2001; eff. June 28, 2001. **Amended:** F. May 27, 2009; eff. June 16, 2009. **Amended:** New title "Coliform Sampling. Amended." F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.24 Disinfection Byproducts Sampling, Analytical and Other Requirements. Amended.

(1) **Purpose.** The purpose of this Rule is to provide for the procedures for establishing maximum contaminant levels, monitoring and other requirements for trihalomethanes, disinfectant residuals, disinfection byproducts, and disinfection byproduct precursors.

(2) **Variances.** Variances from the maximum contaminant level for total trihalomethanes shall be conducted in accordance with 40 CFR, Part 142.60.

(3) Disinfectant Residuals, Disinfection Byproducts, and Disinfection Byproduct Precursors.

(a) Community water systems and non-transient, non-community water systems which add a chemical disinfectant to the water in any part of the drinking water treatment process must modify their practices to meet MCLs and MRDLs specified in subparagraph (7)(a) of Rule 391-3-5-.18, and must meet the treatment technique requirements for disinfection byproduct precursors specified in paragraph (10) of this section.

(b) Transient non-community water systems that use chlorine dioxide as a disinfectant or oxidant must modify their practices to meet the MRDL for chlorine dioxide specified in subparagraph (7)(a) of Rule 391-3-5-.18.

(c) Community Subpart H water systems and non-transient, noncommunity Subpart H water systems must comply with the requirements of this section, as specified in subparagraphs (7)(b)and (7)(c) of Rule 391-3-5-.18, respectively.

(d) Beginning January 1, 2002, transient non-community Subpart H water systems serving 10,000 or more persons and using chlorine dioxide as a disinfectant or oxidant must comply with the requirements for chlorine dioxide and chlorite in this section. (e) Beginning January 1, 2004, transient non-community Subpart H water systems serving fewer than 10,000 people and using chlorine dioxide as a disinfectant or oxidant and systems using only ground water not under the direct influence of surface water and using chlorine dioxide as a disinfectant or oxidant must comply with the requirements for chlorine dioxide and chlorite in this section.

(f) Systems may increase residual disinfectant levels in the distribution system of chlorine or chloramines (but not chlorine dioxide) to a level and for a time necessary to protect public health, to address specific microbiological contamination problems caused by circumstances such as, but not limited to, distribution line breaks, storm run-off events, source water contamination events, or cross-connection events.

(g) Systems must use the analytical method(s) specified in 40 CFR § 141.131 to demonstrate compliance with the requirements of this section. The analytical requirements specified in 40 CFR § 141.131, which is hereby incorporated by reference, are required to demonstrate compliance with the requirements of subpart L (Disinfectant Residuals, Disinfection ByProducts, and Disinfection ByProduct Precursors), subpart U (Initial Distribution System Evaluations), and subpart V (Stage 2 Disinfection ByProducts Requirements) of 40 CFR Part 141.

(h) Monitoring Requirements. 40 CFR § 141.132, in its entirety, is hereby incorporated by reference. For compliance with the requirements of this section, the water systems must monitor the applicable parameters included in this section at the frequency specified in 40 CFR § 141.132. Failure to monitor will be treated as a violation for the entire period covered by the annual average where compliance is based on a running annual average of monthly or quarterly samples or averages and the system's failure to monitor makes it impossible to determine compliance with MCLs or MRDLs.

1. Systems must take all samples during normal operating

conditions.

2. Systems may consider multiple wells drawing water from a single aquifer as one treatment plant for determining the minimum number of TTHM and HAA5 samples required, with the Division approval.

3. Systems may use only data collected under the provisions of this section to qualify for reduced monitoring.

4. Each system required to monitor under this section must develop and implement a monitoring plan. The plan must include at least the following elements: specific locations and schedules for collecting samples for any parameters included in this section; how the system will calculate compliance with MCLs, MRDLs, and treatment techniques; and if approved for monitoring as a consecutive system, or if providing water to a consecutive system, the sampling plan must reflect the entire distribution system.

(i) The system must maintain the plan and make it available for inspection by the Division and the general public no later than thirty (30) days following applicable compliance dates stated in (c) of this section.

(ii) All Subpart H systems serving more than 3,300 people must submit a copy of the monitoring plan to the Division no later than the date of the first report required under 40 CFR § 141.134.

(iii) The Division may require a monitoring plan to be submitted by any other system. The Division may also require changes in any plan elements.

(4) Monitoring and Compliance for Disinfection Byproducts. Monitoring for disinfection byproducts shall be conducted as specified in section 40 CFR § 141.132(b). Compliance with the disinfection byproducts requirements shall be determined in accordance with section 40 CFR § 141.133(b).

(5) **Monitoring and Compliance for Disinfectant Residuals.** Monitoring for disinfectant residuals shall be conducted as specified in section 40 CFR § 141.132(c). Compliance with the disinfectant residuals requirements shall be determined in accordance with section 40 CFR § 141.133(c).

(6) **Monitoring and Compliance for Disinfection Byproduct Precursors.** Monitoring for disinfection byproduct precursors shall be conducted as specified in section 40 CFR § 141.132(d). Compliance with the disinfection byproduct precursors requirements shall be determined in accordance with section 40 CFR § 141.133(c) and as specified by 40 CFR § 141.135(b).

(7) Non-Compliance in First Monitoring Year. If, during the first year of monitoring under 40 CFR § 141.132, any individual quarter's average will cause the running annual average of that system to exceed the MCL, the system shall be considered out of compliance at the end of that quarter.

(8) **Samples for Compliance Determination.** All samples taken and analyzed under the provisions of this section must be included in determining compliance, even if that number is greater than the minimum required. Compliance requirements specified in 40 CFR, Subpart L § 141.133 is hereby incorporated by reference.

(9) **Treatment Techniques.** Treatment techniques for control of disinfection byproduct precursors requirements specified in 40 CFR, Subpart L § 141.135 is hereby incorporated by reference.

(a) Subpart H systems using conventional filtration treatment (as defined in § 141.2) must operate with enhanced coagulation or enhanced softening to achieve the TOC percent removal levels specified in (iv) of this section unless the system meets at least one of the alternative compliance criteria specified in (ii) or (iii) of this section.

(b) Alternative compliance criteria for enhanced coagulation and enhanced softening systems: 40 CFR, Subpart L § 141.135(a)(2) is hereby incorporated by reference.

(c) Additional alternative compliance criteria for softening systems: 40 CFR, Subpart L, § 141.135(a)(3) is hereby incorporated by reference.

(d) Enhanced coagulation and enhanced softening performance requirements: 40 CFR, Subpart L § 141.135(b) is hereby incorporated by reference.

(e) Compliance calculations: 40 CFR, Subpart L § 141.135(c) is hereby incorporated by reference.

(f) Treatment technique requirements for disinfection byproduct precursors: 40 CFR, Subpart L § 141.135(d) is hereby incorporated by reference.

(g) Required additional health information: 40 CFR § 141.154 is hereby incorporated by reference.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Laboratory Approval" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Repealed:** New Rule of same title adopted. F. July 15, 1983; eff. Aug. 4, 1983. **Repealed:** New Rule entitled "Trihalomethanes" adopted. F. May 12, 1989. eff. June 1, 1989. **Amended:** F. Dec. 4, 1990; eff. Dec. 24, 1990. **Repealed:** New Rule entitled "Total Trihalomethanes Sampling. Analytical and Other Requirements" adopted. F. June 25, 1992; eff. July 15, 1992. **Amended:** F. Sept. 26, 1997; eff. Oct. 16, 1997. **Amended:** F. Sept. 29, 2000; eff. Oct. 19, 2000. **Amended:** F. June 8, 2001; eff. June 28, 2001. **Amended:** F. May 29, 2009; eff. June 16, 2009. **Amended:** New title "Disinfection Byproducts Sampling, Analytical and Other Requirements. Amended." F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.25 Treatment Techniques, Lead and Copper Requirements. Amended.

(1) General Requirements.

(a) These requirements constitute the primary drinking water rules for lead and copper. Unless otherwise indicated, each of these provisions applies to community water systems and non-transient, non-community water systems (hereinafter referred to as "water systems" or "systems").

(b) These rules establish a treatment technique that includes requirements for corrosion control treatment, source water treatment, lead service line replacement, and public education. These requirements are triggered, in some cases, by lead and copper action levels measured in samples collected at consumers' taps.

(c) Lead and copper action levels:

1. The lead action level is exceeded if the concentration of lead in more than 10 percent of tap water samples collected during any monitoring period conducted in accordance with Section 391-3-5-.25(7) is greater than 0.015 mg/L.

2. The copper action level is exceeded if the concentration of copper in more than 10 percent of tap water samples collected during any monitoring period conducted in accordance with Section 391-3- 5-.25(7) is greater than 1.3 mg/L.

3. Calculation of the lead and copper action levels shall be based on the "90th percentile" rule in accordance with 40 CFR, Part 141.80(c)(3).

(d) Corrosion control treatment requirements:

1. All water systems shall install and operate optimal corrosion control treatment as defined in Section 391-3-5-.02(73).

2. Any water system that complies with the applicable corrosion

control treatment requirements specified by the Division under Section 391-3-5-.25(2) and (3) shall be deemed in compliance with the treatment requirement contained in paragraph (d)(1) of this section.

(e) Source water treatment requirements; Any system exceeding the lead or copper action level shall implement all applicable source water treatment requirements specified by the "Division" under Section 391-3-5-.25(4).

(f) Lead service line replacement requirements; Any system exceeding the lead action level after implementation of applicable corrosion control and source water treatment requirements shall complete the lead service replacement requirements contained in Section 391-3-5-.25(5).

(g) Public education requirements; Pursuant to 40 CFR, Part 141.85, all water systems must provide a consumer notice of lead tap water monitoring results to persons served at the sites/taps that are tested. Any system exceeding the lead action level shall implement the public education requirements contained in Section 391-3-5-.25(6).

(h) Monitoring and analytical requirements; Tap water monitoring for lead and copper, monitoring for water quality parameters, source water monitoring for lead and copper, and analyses of the monitoring results under this subpart shall be completed in compliance with Section 391-3-5-.25(7)-(10).

(i) Reporting requirements; Systems shall report to the Division any information required by the treatment provisions of this subpart and Section 391-3-5-.30(7).

(j) Record keeping requirements; Systems shall maintain records in accordance with Section 391-3-5-.15.

(k) Violation of national primary drinking water regulations; Failure to comply with the applicable requirements of Section 391-3-5- .25(1)-(10), including requirements established by the Division pursuant to the provisions, shall constitute a violation of the national primary drinking water regulations for lead and/or copper.

(l) The maximum contaminant level goals (MCLGs) for lead and copper are as follows:

Contaminant	MCLG (mg/L)
Copper	1.3
Lead	0 (zero)

(2) Applicability of Corrosion Control Treatment Steps to Small, Medium and Large Water Systems.

(a) Systems shall complete the applicable corrosion control treatment requirements described in Section 391-3-5-.25(3) by the deadlines established in this section.

1. A large system (serving more than 50,000 persons) shall complete the corrosion control treatment steps specified in paragraph (d) of this section, unless it is deemed to have optimized corrosion control under paragraph (b)2. or (b)3. of this section.

2. A small system (serving less than 3,301 persons) and a medium-size system (serving more than 3,300 and less than 50,001 persons) shall complete the corrosion control treatment steps specified in paragraph (d) of this section, unless it is deemed to have optimized corrosion control under paragraph (b)1., (b)2., or (b)3. of this section.

(b) A system is deemed to have optimized corrosion control and is not required to complete the applicable control treatment steps identified in this section if the system satisfies one of the criteria specified in paragraphs (b)1. through (b)3. of this section. Any such system deemed to have optimized corrosion control under this paragraph, and which has treatment in place, shall continue to operate and maintain optimal corrosion control treatment and meet any requirements that the State determines appropriate to ensure optimal corrosion control treatment is maintained.

1. A small or medium-size water system is deemed to have optimized corrosion control if the system meets the lead and copper action levels during each of two consecutive six-month monitoring periods conducted in accordance with Section 391-3-5-.25(7).

2. Any water system may be deemed by the Division to have optimized corrosion control treatment if the system demonstrates to the satisfaction of the Division that it has conducted activities equivalent to the corrosion control steps applicable to such system under this section. If the Division makes this determination, it shall provide the system with written notice explaining the basis for its decision and shall specify the water quality control parameters representing optimal corrosion control in accordance with Section 391-3-5-.25(3). Water systems deemed to have optimized corrosion control under this paragraph shall operate in compliance with the Division designated optimal water quality control parameters in accordance with 391-3-5-.25(3) and continue to conduct lead and copper tap water quality parameter sampling in accordance with Rule sections 391-3-5-.25(7)(d)3. and 391-3-5-.25(8)(d). A system shall provide the Division with the following information in order to support a determination under this paragraph.

(i) the results of all test samples collected for each of the water quality parameters in Section 391-3-5-.25(3).

(ii) a report explaining the test methods used by the water system to evaluate the corrosion control treatments listed in Section 391-3-5-.25(3), the results of all tests conducted, and the basis for the system's selection of optimal corrosion control treatment.

(iii) a report explaining how corrosion control has been installed and how it is being maintained to insure minimal lead and copper concentrations at consumers' taps.

(iv) the results of tap water samples collected in accordance with

Section 391-3-5-.25(7) at least once every six months for one year after corrosion control has been installed.

3. Any water system is deemed to have optimized corrosion control if it submits results of tap water monitoring conducted in accordance with Section 391-3-5-.25(7) and source water monitoring conducted in accordance with Section 391-3-5-.25(9) that demonstrates for two consecutive six-month monitoring periods that the difference between the 90th percentile tap water lead level computed under Section 391-3-5-.25(1)(c)3., and the highest source water lead concentration, is less than the Practical Quantitation Level for lead specified in Section 391-3-5-.25(10).

(i) Those systems whose highest source water lead level is below the Method Detection Limit may also be deemed to have optimized corrosion control under this paragraph if the 90th percentile tap water lead levels is less than or equal to the Practical Quantitation Level for the lead for two consecutive 6-month monitoring periods.

(ii) Any system deemed to have optimized corrosion control in accordance with this paragraph shall continue monitoring for lead and copper at the tap no less frequently than once every three calendar years using the reduced number of sites specified in Rule 391- 3-5-.25(7)(c) and collecting samples at times and locations specified in Rule 391-3-5-.25(7)(d)4.

(iii) Any water system deemed to have optimized corrosion control pursuant to this paragraph shall notify the Division in writing pursuant to Rule 391-3-5-.25(11) of any upcoming longterm change in treatment or addition of a new source. The Division must review and approve the addition of a new source or long-term change in water treatment before it is implemented by the water system. The Division may require any system to conduct additional monitoring or to take other action the Division deems appropriate to ensure that such systems maintain minimal levels of corrosion in the distribution system.

(iv) As of July 12, 2001, a system is not deemed to have optimized corrosion control under this paragraph, and shall implement

corrosion control treatment pursuant to paragraph (2)(b) 3.(v) of this section unless it meets the copper action level.

(v) Any system triggered into corrosion control because it is no longer deemed to have optimized corrosion control under this paragraph shall implement corrosion control treatment in accordance with the deadlines in paragraph (d) of this section. Any such large system shall adhere to schedule specified in that paragraph for medium-size systems, with the time periods for completing each step being triggered by the date the system is no longer deemed to have optimized corrosion control under this paragraph.

(c) Any small or medium-size water system that is required to complete the corrosion control steps due to its exceedance of the lead or copper action level may request approval from the Division to cease completing the treatment steps if the system meets both lead and copper action levels during each of two consecutive monitoring periods conducted pursuant to Section 391-3-5-.25(7) and submits the results to the Division. If approval is granted, any such water system thereafter exceeds the lead or copper action level during any monitoring period, the system (or the Division, as the case may be) shall recommence completion of the applicable treatment steps, beginning with the first treatment step which was not previously completed in its entirety. The Division may require a system to repeat treatment steps previously completed by the system where the Division determines that this is necessary to implement properly the treatment requirements of this section. The Division shall notify the water system in writing of such a determination and explain the basis for its decision. The requirement for any small- or medium-size water system to implement corrosion control treatment steps in accordance with paragraph (d) of this section (including, water systems deemed to have optimized corrosion control under paragraph (b)1. of this section) is triggered whenever any small- or medium-size water system exceeds the lead or copper action level.

(d) Treatment steps and deadlines for all systems affected by this rule shall be in accordance with 40 CFR, Part 141.81(d) and (e).

(3) **Description of Corrosion Control Treatment Requirements.** Each system shall complete the corrosion control treatment requirements as described and in accordance with 40 CFR Part 141.82 and as approved by the Division.

(4) **Source Water Treatment Requirements.** Systems shall complete the applicable source water monitoring and treatment requirements, described in the referenced portions of paragraph (b) of this section, and in Section 391-3-5-.25(7) and (9) by the following deadlines.

(a) Deadlines for Completing Source Water Treatment Steps.

1. Step 1: A system exceeding the lead or copper action level shall complete lead and copper source water monitoring (Section 391-3-5- .25(9)(b)) and make a treatment recommendation to the Division (Section 391-3-5-.25(4)(b)1.) no later than 180 days after the end of the monitoring period in which the lead or copper action level was exceeded.

2. Step 2: The Division shall make a determination regarding source water treatment (Section 391-3-5-.25(4)(b)2.) within 6 months after submission of monitoring results under Step 1.

3. Step 3: If the Division requires installation of source water treatment, the system shall install the treatment (Section 391-3-5-.25(4)(b)3.) within 24 months after completion of Step 2.

4. Step 4: The system shall complete follow-up tap water monitoring for lead and copper (Section 391-3-5-.25(7)(d)2.) and source water monitoring for lead and copper (Section 391-3-5-.25(9)(c)) within 36 months after completion of Step 2.

5. Step 5: The Division shall review the system's installation and operation of source water treatment and specify maximum permissible source water levels (Section 391-3-5- .25(4)(b)4.) within 6 months after completion of Step 4.

6. Step 6: The system shall operate in compliance with the Division specified maximum permissible lead and copper source water levels (Section 391-3-5-.25(4)(b)4.) and continue source water monitoring for lead and copper (Section 391-3-5-.25(9)(d)).

(b) Description of Source Water Treatment Requirements:

1. System treatment recommendation. Any system which exceeds the lead or copper action level shall recommend in writing to the Division the installation and operation of one of the source water treatments listed in paragraph (b)2. of this section. A system may recommend that no treatment be installed based upon a demonstration that source water treatment is not necessary to minimize lead and copper levels at users' taps.

2. Division determination regarding source water treatment. The Division shall complete an evaluation of the results of all source water samples submitted by the water system to determine whether source water treatment is necessary to minimize lead or copper levels in water delivered to users' taps. If the Division determines that treatment is needed, the Division shall either require installation and operation of the source water treatment recommended by the system (if any) or require the installation and operation of another source water treatment such as: ion exchange, reverse osmosis, lime softening or coagulation/filtration. If the Division requests additional information to aid in its review, the water system shall provide the information by the date specified by the Division in its request. The Division shall notify the system in writing of its determination and set forth the basis for its decision.

3. Installation of source water treatment. Each system shall properly install and operate the source water treatment designated by the Division under paragraph (b)2. of this section.

4. Division review of source water treatment and specification of maximum permissible source water levels. The Division shall review the source water samples taken by the water system both before and after the system installs source water treatment, and determine whether the system has properly installed and operated the source water treatment designated by the Division. Based upon its review, the Division shall designate the maximum permissible lead and copper concentrations for finished water entering the distribution system. Such levels shall reflect the contaminant removal capability of the treatment properly operated and maintained. The Division shall notify the system in writing and explain the basis for its decision.

5. Continued operation and maintenance. Each water system shall maintain lead and copper levels below the maximum permissible concentrations designated by the Division at each sampling point monitored in accordance with Section 391-3-5-.25(9). The system is out of compliance with this paragraph if the level of lead and/or copper at any sampling point is greater than the maximum permissible concentration designated by the Division.

6. Modification of Division treatment decisions. Upon its own initiative or in response to a request by a water system or other interested party, the Division may modify its determination of the source water treatment under paragraph (2) of this section, or maximum permissible lead and copper concentrations for finished water entering the distribution system under paragraph (4) of this section. A request for modification by a system or other interested party shall be in writing, explain why the modification is appropriate, and provide supporting documentation. The Division may modify its determination where it concludes that such change is necessary to ensure that the system continues to minimize lead and copper concentrations in source water. A revised determination shall be made in writing, set forth the new treatment requirements, explain the basis for the Division's decision, and provide an implementation schedule for completing the treatment modifications.

7. EPA may review treatment determinations made by the Division and issue federal treatment determinations as outlined in 40 CFR, Part 141.83(b)(7).

(5) Lead Service Line Replacement Requirements. Systems

may be required to replace lead service lines when they fail to meet the lead action level in tap samples. 40 CFR, Part 141.84 describes the conditions that will require lead service line replacement.

(6) **Public Educational and Supplemental Monitoring Requirements.** All water systems must deliver a consumer notice of lead tap water monitoring results to persons served by the water system at the sites/taps that are tested. A water system that exceeds the lead action level based on tap water samples collected in accordance with Section 391-3-5-.25(7) shall carry out a public education program as described in 40 CFR, Part 141.85.

(7) Monitoring Requirements for Lead and Copper in Tap Water.

(a) Sample site location.

1. By the applicable date for commencement of monitoring under paragraph (d)1. of this section, each water system shall complete a materials evaluation of its distribution system. In order to identify a pool of targeted sampling sites that meets the requirements of this section, and which is sufficiently large to ensure that the water system can collect the number of lead and copper tap samples required in paragraph (c) of this section. All sites from which first draw samples are collected shall be selected from this pool of targeted sampling sites. Sampling sites may not include faucets that have point-of-use or point-of-entry treatment devices.

2. A water system shall use the information on lead, copper, and galvanized steel that it is required to collect under Section 391-3-5-.26(3) of this part [special monitoring for corrosivity characteristics] when conducting a materials evaluation. When an evaluation of the information collected pursuant to Section 391-3-5-.26(3) is insufficient to locate the requisite number of lead and copper sampling sites that meet the targeting criteria in paragraph (a)1. of this section, the water system shall review the sources of information listed below in order to identify a sufficient number of sampling sites. In addition, the system shall seek to collect such information where possible in the course of its normal operations

(e.g., checking service line materials when reading water meters or performing maintenance activities):

(i) all plumbing codes, permits, and records in the files of the building department(s) which indicate the plumbing materials that are installed within publicly and privately owned structures connected to the distribution system;

(ii) all inspections and records of the distribution system that indicate the material composition of the service connections that connect a structure to the distribution system; and

(iii) all existing water quality information, which includes the results of all prior analyses of the system or individual structures connected to the system, indicating locations that may be particularly susceptible to high lead or copper concentrations.

3. The sampling sites selected for a community water system's sampling pool ("tier 1 sampling sites") shall consist of single family structures that:

(i) contain copper pipes with lead solder installed after 1982 or contain lead pipes; and/or

(ii) are served by a lead service line. When multiple-family residences comprise at least 20 percent of the structures served by a water system, the system may include these types of structures in its sampling pool.

4. Any community water system with insufficient tier 1 sampling sites shall complete its sampling pool with "tier 2 sampling sites", consisting of buildings, including multiple-family residences that:

(i) contain copper pipes with lead solder installed after 1982 or contain lead pipes; and/or

(ii) are served by a lead service line.

5. Any community water system with insufficient tier 1 and tier 2 sampling sites shall complete its sampling pool with "tier 3 sampling sites", consisting of single family structures that contain copper pipes with lead solder installed before 1983. A community

water system with insufficient tier 1, tier 2, and tier 3 sampling sites shall complete its sampling pool with representative sites throughout the distribution system. For the purpose of this paragraph, a representative site is a site in which the plumbing materials used at that site would be commonly found at other sites served by the water system.

6. The sampling sites selected for a non-transient non-community water system ("tier 1 sampling sites") shall consist of buildings that:

(i) contain copper pipes with lead solder installed after 1982 or contain lead pipes; and/or

(ii) are served by a lead service line.

7. A non-transient non-community water system with insufficient tier 1 sites that meet the targeting criteria in paragraph (a)6. of this section shall complete its sampling pool with sampling sites that contain copper pipes with lead solder installed before 1983. If additional sites are needed to complete the sampling pool, the non-transient non-community water system shall use representative sites throughout the distribution system. For the purpose of this paragraph, a representative site is a site in which the plumbing materials used at that site would be commonly found at other sites served by the water system.

8. Any water system whose sampling pool does not consist exclusively of tier 1 sites shall demonstrate to the Division under Section 391-3-5-.25(11) why a review of the information listed in paragraph (a)2. of this section was inadequate to locate a sufficient number of tier 1 sites. Any community water system which includes tier 3 or other representative sampling sites in its sampling pool shall demonstrate why it was unable to locate a sufficient number of tier 1 and tier 2 sampling sites.

9. Any water system whose distribution system contains lead service lines shall draw 50 percent of the samples it collects during each monitoring period from sites that contain lead pipes, or

copper pipes with lead solder, and 50 percent of those samples from sites served by a lead service line. A water system that cannot identify a sufficient number of sampling sites served by lead service line shall collect first draw samples from all of the sites identified as being served by such lines.

(b) Sample collection methods.

1. All tap samples for lead and copper collected in accordance with this subpart, with the exception of lead service line samples collected under Section 391-3-5-.25(5), shall be first draw samples.

2. Each first-draw tap sample for lead and copper shall be one liter in volume and must have stood motionless in the plumbing system of each sampling site for at least six hours. First draw samples from residential housing shall be collected from the coldwater kitchen or bathroom sink tap. First-draw samples from a non-residential building shall be one liter in volume and shall be collected at an interior tap from which is typically drawn for consumption. First draw samples may be collected by the system or the system may allow residents to collect first draw samples after instructing the residents of the sampling procedures specified in this paragraph. To avoid problems of residents handling nitric acid, acidification of first-draw samples may be done up to fourteen (14) days after the sample is collected. After acidification to resolubilize the metals, the sample must stand in the original container for the time specified in the approved EPA method before the sample can be analyzed. If a system allows residents to perform sampling, the system may not challenge, based on alleged errors in sample collection, the accuracy of sampling results.

3. Each service line sample shall be one liter in volume and have stood motionless in the lead service line for at least six hours. Lead service line samples shall be collected in one of the following three ways:

(i) at the tap after flushing the volume of water between the tap and the lead service line. The volume of water shall be calculated based on the interior diameter and length of the pipe between the tap and the lead service line;

(ii) tapping directly into the lead service line; or

(iii) if the sampling site is a building constructed as a singlefamily residence, allowing the water to run until there is a significant change in temperature which would be indicative of water that has been standing in the lead service line.

4. A water system shall collect each first draw tap sample from the same sampling site from which it collected a previous sample. If, for any reason, the water system cannot gain entry to a sampling site in order to collect a follow-up tap sample or a particular site is no longer available, the system may collect the follow-up tap sample from another sampling site in its sampling pool as long as the new site meets the same targeting criteria, and is within reasonable proximity of the original site.

5. A non-transient non-community water system, or a community water system that meets the criteria of Rule 391-3-5-.25(7)(a)3.-7. that does not have enough taps that can supply first-draw samples, as defined in Rule 391-3-5-.25(7)(b)2., must collect multiple samples from available sites/taps, provided the samples are collected at different times and/or on different days in order to meet the "first-draw"/6-hour minimum non-use time criteria.

(c) Number of samples.

Water systems shall collect at least one sample during each monitoring period specified in paragraph (d) of this section from the number of sites listed in the first column below ("Number of Sites Standard Monitoring") of the table in this paragraph. A system conducting reduced monitoring under paragraph (d)4. of this section shall collect at least one sample from the number of sites specified in the second column ("Number of Sites Reduced Monitoring") of the table in this paragraph during each monitoring period specified in paragraph (d)4. of this section. Such reduced monitoring sites shall be representative of the sites required for standard monitoring. States may specify sampling locations when a system is conducting reduced monitoring. The table is as follows:

System Size	Number of Sites	Number of Sites
Population Served	Standard Monitoring	Reduced Monitoring
100,001 or more	100	50
10,001 to 100,000	60	30
3,301 to 10,000	40	20
501 to 3,300	20	10
101 to 500	10	5
100 or fewer	5	5

(d) Timing of monitoring.

1. Initial tap sampling: Two consecutive six-month periods, between January-June and between July-December.

(i) All large systems shall monitor at the required number of standard monitoring sites during two consecutive six-month periods.

(ii) All small and medium-size systems shall monitor at the required number of standard monitoring sites during each sixmonth monitoring period until:

(I) the system exceeds the lead or copper action level and is therefore required to implement the corrosion control treatment requirements under Section 391-3-5-.25(2), in which case the system shall continue monitoring in accordance with paragraph (d)2. of this section, or

(II) the system meets the lead or copper action levels during two consecutive six-month monitoring periods, in which case the system may reduce monitoring in accordance with paragraph (d)4. of this section.

2. Monitoring after installation of corrosion control and source

water treatment.

(i) Any large system which installs optimal corrosion control treatment pursuant to Section 391-3-5-.25(2)(d) shall monitor during two consecutive six-month monitoring periods by the date specified in Section 391-3-5-.25(2)(d).

(ii) Any small or medium-size system which installs optimal corrosion control treatment pursuant to Section 391-3-5-.25(2) shall monitor during two consecutive six-month monitoring periods by the date specified in Section 391-3-5-.25(2)(d).

(iii) Any system which installs source water treatment pursuant to Section 391-3-5-.25(4)(a)3. shall monitor during two consecutive six-month monitoring periods by the date specified in Section 391-3-5-.25(4)(a)4.

3. Monitoring after Division specifies water quality parameter values for optimal corrosion control. After the Division specifies the value for water quality control parameters under Section 391-3-5-.25(3), the system shall monitor during each subsequent sixmonth monitoring period, with the first monitoring period to begin on the date the Division specifies the optimal values under Section 391-3-5-.25(3).

4. Reduced monitoring.

(i) A small or medium-size water system that meets the lead and copper action levels during each of two consecutive six-month monitoring periods may reduce the number of samples in accordance with paragraph (c) of this section, and reduce the frequency of sampling to once per year between the months of June and September of the calendar year immediately following the end of the second consecutive six-month monitoring period.

(ii) Any water system that meets the lead and copper action levels and maintains the range of values for the water quality control parameters reflecting optimal corrosion control treatment specified by the Division under Section 391-3-5-.25(3) during each of two consecutive six-month monitoring periods may reduce the frequency of monitoring to once per year between the months of June and September and reduce the number of lead and copper samples in accordance with paragraph (c) of this section if it receives written approval from the division. This sampling shall begin during the calendar year immediately following the end of the second consecutive six-month monitoring period. The Division shall review monitoring, treatment, and other relevant information submitted by the water system in accordance with 391- 3-5-.25(11) and shall notify the water system is eligible to commence reduced monitoring to once every three (3) years pursuant to this paragraph. The Division shall review, and where appropriate, revise its determination when the system submits new monitoring or treatment data, or when other data relevant to the number and frequency of tap sampling becomes available.

(iii) A small or medium-size water system that meets the lead and copper action levels during three consecutive years of monitoring may reduce the frequency of monitoring for lead and copper from annually to once every three years. Sampling must still occur between the months of June and September of the year in which monitoring is required. Any water system that meets the lead and copper action levels and maintains the range of values for the water quality control parameters reflecting optimal corrosion control treatment specified by the Division under Section 391-3-5-.25(3) during three consecutive years of monitoring may reduce the frequency from annually to once every three years if it receives written approval from the Division. Samples collected once every three years must be collected no later than every third calendar year. The Division shall review monitoring, treatment, and other relevant information submitted by the water system in accordance with 391-3-5-.25(11) and shall notify the system in writing when it determines the system is eligible to reduce the frequency of monitoring to once every three years. The Division shall review, and where appropriate, revise its determination when the system submits new monitoring or treatment data, or when other data relevant to the number and frequency of tap sampling becomes

available.

(iv) A water system that reduces the number and frequency of sampling shall collect these samples from representative sites included in the original pool of targeted sampling sites identified in paragraph (a)1. of this section. Systems sampling annually or less frequently shall conduct the lead and copper tap sampling during the months of June, July, August or September unless the Division has approved a different sampling period in accordance with paragraph (d)4.(iv)(1) of this section.

(I) The Division, at its discretion, may approve a different period for conducting the lead and copper tap sampling for systems collecting a reduced number of samples. Such a period shall be no longer than four consecutive months and must represent a time of normal operation where the highest levels of lead are most likely to occur. For non-transient non-community water system that does not operate during the months of June, through September, and for which the period of normal operation where the highest levels of lead are most likely to occur is not known, the Division shall designate a period that represents a time of normal operation for the system. Any alternate reduced monitoring must meet criteria set forth in 40 CFR, part 141.86(d)(4)(iv)(A).

(II) Systems monitoring annually, that have been collecting samples during the months of June through September and that receive Division approval to alter their sample collection period under paragraph (d)4.(iv)(I) of this section, must collect their next round of samples during a time period that ends no later than 21 months after the previous round of sampling. Systems monitoring triennially that have been collecting samples during the months of June through September, and receive Division approval to alter the sampling collection period per paragraph (d)4.(iv)(I) of this section, must collect their next round of samples during a time period that ends no later than 45 months after the previous round of sampling. Subsequent rounds of sampling must be collected annually or triennially, as requested by this section. Small systems with waivers, granted pursuant to paragraph (g) of this section, that have been collecting samples during the months of June through September and receive Division approval to alter their sample collection period under paragraph (d)4.(iv)(I) of this section must collect their next round of samples before the end of the 9-year period.

(v) Any water system that demonstrates for two consecutive 6month monitoring periods that the tap water lead level computed under Rule 391-3-5-.25(1)(c)3. is less than or equal to 0.005 mg/L and the tap water copper level computed under Rule 391-3-5-.25(1)(c)3. is less than or equal to 0.65 mg/L may reduce the number in accordance with paragraph (3) of this section and reduce the frequency of sampling to once every three calendar years.

(vi)(I) A small or medium-size water system subject to reduced monitoring that exceeds the lead or copper action level shall resume sampling in accordance with paragraph (d)3.of this section and collect the number of samples for standard monitoring under paragraph (c) of this section. Such a system shall also conduct water quality parameter monitoring in accordance with 40 CFR, Part 141.87(b), (c) or (d) (as appropriate) during the monitoring period in which it exceeded the action level. Any such system may resume annual monitoring for lead and copper at the tap at the reduced number of sites specified in paragraph (c) of this section after it has completed two consecutive six-month rounds of monitoring with no action level exceeded.

(II) Any water system subject to the reduced monitoring frequency that fails to meet the lead or copper action level during any four-month monitoring period or that fails to operate at or above the minimum value or within the range of values for the water quality parameters specified by the Division for more than nine days in any six-month monitoring period shall conduct tap water sampling for lead and copper at the frequency specified in paragraph (d)3. of this section, collect the number of samples specified for standard monitoring under paragraph (c) of this section, and shall resume monitoring for water quality parameters

within the distribution system in accordance with 40 CFR, Part 141.87(d). This standard tap water sampling shall begin no later than the six-month period beginning January 1 of the calendar year following the lead or copper action level exceedance or water quality parameter excursion. Such a system may resume reduced monitoring for lead and copper at the tap and for water quality parameters within the distribution system under the following conditions:

I. The system may resume annual monitoring for lead and copper at the tap at the reduced number of sites specified in paragraph (c) of this section after it has completed two consecutive six-month rounds of monitoring that meet both lead and copper action levels and the system has received written approval from the Division that it is appropriate to resume reduced monitoring on an annual frequency. This sampling shall begin during the calendar year immediately following the end of the second consecutive sixmonth monitoring period.

II. The system may resume triennial monitoring for lead and copper at the tap at the reduced number of sites after it demonstrates through subsequent rounds of monitoring that it meets the action level criteria for lead and copper and has received approval from the Division that it is appropriate to resume triennial monitoring.

III. The system may reduce the number of water quality parameter tap water samples required and the frequency with which it collects such samples in accordance with 40 CFR, Part 141.87(e)(1) and (2). Such a system may not resume triennial monitoring for water quality parameters at the tap until it demonstrates that it has re-qualified for triennial monitoring, in accordance with 40 CFR, Part 141.87(e)(2).

(vii) Any water system subject to a reduced monitoring frequency under paragraph (d)(4) of this section shall notify the Division in writing of any upcoming long-term change in treatment or addition of a new source as described in 40 CFR, Part 141.90(a)(3). The Division must review and approve the addition of a new source or long-term change in water treatment before it is implemented by the water system. The Division may require the system to resume sampling in accordance with paragraph (7)(d)3. of this section and collect the number of samples specified for standard monitoring under paragraph (7)(c) of this section or take other appropriate steps such as increased water quality parameter monitoring or reevaluation of its corrosion control treatment given the potentially different water quality considerations.

(e) Additional monitoring by systems. The results of any monitoring conducted in addition to the minimum requirements of this section shall be considered by the system and the Division in making any determinations (i.e., calculating the 90th percentile lead or copper level) under this subpart or 40 CFR Part 141.82.

(f) Invalidation of lead or copper tap water samples. A sample invalidated under this paragraph does not count toward determining lead or copper 90th percentile levels under 391-3-5-.25(1)(c) or toward meeting the minimum monitoring requirements of paragraph (c) of this section.

1. The Division may invalidate a lead or copper tap water sample if at least one of the following conditions is met.

(i) The laboratory establishes that improper sample analysis caused erroneous results.

(ii) The Division determines that the sample was taken from a site that did not meet the site selection criteria of this section.

(iii) The sample container was damaged in transit.

(iv) There is substantial reason to believe that the sample was subject to tampering.

2. The system must report the results of all samples to the Division and all supporting documentation for samples the system believes should be invalidated.

3. To invalidate a sample under paragraph (f)1. of this section, the

decision and the rationale for the decision must be documented in writing. The Division may not invalidate a sample solely on the grounds that a follow-up sample result is higher or lower than that of the original sample.

4. The water system must collect replacement samples for any samples invalidated under this section if, after the invalidation of one or more samples, the system has too few samples to meet the minimum requirements of paragraph (c) of this section. Any such replacement samples must be taken as soon as possible, but no later than 20 days after the date the Division invalidates the sample or by the end of the applicable monitoring period, whichever occurs later. Replacement samples taken after the end of the applicable monitoring period shall not be used to meet the monitoring requirements of a subsequent monitoring period. The replacement samples or, if that is not possible, at locations other than those already used for sampling during the monitoring period.

(g) Monitoring waivers for small systems. Any small system that meets the criteria of 40 CFR, Section 141.86(g) may apply to the Division to reduce the frequency of monitoring for lead and copper.

(8) Monitoring Requirements for Water Quality Parameters. All large water systems and all small and medium-size systems that exceed the lead or copper action level shall monitor water quality parameters in addition to lead and copper in accordance with this section. The requirements of this section are summarized in a table at the end of 40 CFR, Part 141.87.

(a) Systems will have to monitor water quality parameters at different locations.

1. Representative taps throughout the distribution system (system can use total coliform sample sites). The system should take into account the number of persons served, the different sources of water, the different treatment methods employed by the system, and seasonal variability. 2. Samples are to be collected of the treated water from each source before entry point to the distribution system. If the system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of normal operating conditions (i.e., when water is representative of all sources being used).

3. Number of samples.

(i) Systems shall collect two tap samples for applicable water quality parameters during each monitoring period as described in paragraphs (b) through (e) of this section. The following number of sites is required:

Distribution System Tap Sampling Requirements for Water Quality Parameters. (Other Than Lead and Copper)

System Size	Number of Distribution Sampling Sites	
Population Served	Base Monitoring	
100,001 or more	25	
10,001 to 100,000	10	
3,301 to 10,000	3	
501 to 3,300	2	
101 to 500	1	
100 or fewer	1	

(ii) Except as provided in paragraph (c) of this section, systems shall collect two samples for each water quality parameter at each entry point to the distribution system during each monitoring period as described in paragraph (b) of this section. During each monitoring period specified in paragraphs (c)-(e) of this section, systems shall collect one sample for each applicable water quality parameter at each entry point to the distribution system. (b) Initial Sampling - All large water systems shall measure the water quality parameters listed below at distribution system taps and at each entry point to the distribution system during each sixmonth monitoring period (specified in Section 391-3-5-.25(7)(d)1.).

1. pH;

- 2. alkalinity;
- 3. calcium;
- 4. conductivity;

5. orthophosphate, when an inhibitor containing phosphate is used;

6. silica, when an inhibitor containing silica is used;

7. Water temperature.

(c) Monitoring after installation of corrosion control. All large systems which install optimal corrosion control treatment according to Section 391-3-5-.25(7)(d)2.(i) shall measure water quality parameters at the locations and frequencies listed below during each six month monitoring period. All small or medium size systems which install optimal corrosion treatment shall conduct such monitoring during each six-month monitoring period specified in Section 391-3-5-.25(7)(d)2.(ii) only when the system exceeds the lead and copper action level.

1. At the required number of distribution system sites/taps, two samples every six months for:

(i) pH;

(ii) alkalinity;

(iii) orthophosphate, when an inhibitor containing phosphate is used;

(iv) silica, when an inhibitor containing silica is used;

(v) calcium;

2. At each entry point to the distribution system, one sample

every two weeks for:

(i) pH;

(ii) when alkalinity is adjusted as part of optimal corrosion control, a reading of the dosage rate of the chemical used to adjust alkalinity, and the alkalinity concentration.

(iii) when a corrosion inhibitor is used as part of optimal corrosion control, a reading of the dosage rate of the inhibitor used, and the concentration of orthophosphate or silica.

(d) Monitoring after the Division specifies water quality parameter values for optimal corrosion control will be as follows. The Division will specify the values for applicable water quality control parameters reflecting optimal corrosion control treatment in accordance with 40 CFR Part, 141.82(f). All large systems shall measure the applicable water quality parameters in accordance with paragraph (c) of this section and determine compliance with the requirements of 391-3-5-.25(7)(d)3 every six months with the first six-month period to begin on January 1 or July 1, whichever comes first, after the Division specifies optimal values under 40 CFR, Part 141.82(f). Any small or medium-size system shall conduct such monitoring during each six-month period specified in this paragraph in which the system exceeds the lead and/or copper action level(s). For any such small and medium-size system that is subject to a reduced monitoring frequency pursuant to 391-3-5-.25(7)(d)4. at the time of the action level exceedance, the start of the applicable six-month period under this paragraph shall coincide with the start of the applicable monitoring period under 391-3-5-.25(7)(d)4. Compliance with the division-designated optimal water quality parameter values shall be determined as specified under 391-3-5-.25(7)(d)3.

(e) Reduced monitoring for water quality parameters.

1. Any water system that maintains the range of values for the water quality parameters reflecting optimal corrosion control treatment during each of two consecutive six-month monitoring periods under paragraph (d) of this section shall continue monitoring at the entry point(s) to the distribution system as specified in paragraph (c)2. of this section. Such system may collect two tap samples for applicable water quality parameters from the following reduced number of sites during each six-month monitoring period.

System Size Population Served	Number of Distribution Sampling Sites Reduced Monitoring	
100,001 or more	10	
10,001 to 100,000	7	
3,301 to 10,000	3	
501 to 3,300	2	
101 to 500	1	
100 or fewer	1	

2.(i) Any water system that maintains the range of values for the water quality parameters reflecting optimal corrosion control treatment specified by the Division under Section 391-3-5-.25(3) during three consecutive years of monitoring may reduce the frequency with which it collects the number of tap samples for applicable water quality parameters specified in paragraph (e)1. of this section from every six months to annually. This sampling begins during the calendar year immediately following the end of the monitoring period in which the third consecutive year of sixmonth monitoring occurs. Any water system that maintains the range of values for the water quality parameters reflecting optimal corrosion control treatment specified by the Division during three consecutive years of annual monitoring under this paragraph may reduce the frequency with which it collects the number of tap samples for applicable water quality parameters from annually to every three years. This sampling begins no later than the third calendar year following the end of the monitoring period in which

the third consecutive year of monitoring occurs.

(ii) A water system may reduce the frequency with which it collects tap samples for applicable water quality parameters specified in paragraph (e)1. of this section to every three years if it demonstrates during two consecutive monitoring periods that its tap water lead level at the 90th percentile is less than or equal to the practical quantitation limit (PQL) for lead specified in 391- 3-5-.25(10), that its tap water copper level is less than or equal to 0.65 mg/L for copper in 391-3-5-.25(2)(c), and that it also has maintained the range of values for the water quality parameters reflecting optimal corrosion control treatment specified by the division under 391-3-5-.25(2)(d). Monitoring conducted every three years must be done no later than every third calendar year.

3. A water system that conducts sampling annually shall collect these samples evenly throughout the year so as to reflect seasonal variability.

4. Any water system subject to reduced monitoring frequency that fails to operate at or above the minimum value within the range of values for the water quality parameters specified by the Division under Section 391-3-5-.25(3) shall resume distribution system tap water sampling in accordance with the number and frequency requirements in paragraph (d) of this section. Such a water system may resume annual monitoring for water quality parameters at the tap at the reduced number of sites specified under Section 391-3-5-.25(8)(e)1. after it has completed two subsequent consecutive sixmonth rounds of monitoring that meet the criteria of that paragraph or may resume triennial monitoring for water quality parameters at the tap at the reduced number of sites after the water system demonstrates through subsequent rounds of monitoring that the water system meets the criteria of either paragraph (e)2.(i) or (e)2.(ii) of this section or both.

(f) Additional monitoring by systems must be approved by the Division.

(9) Monitoring Requirements for Lead and Copper in Source

Water.

(a) Sample location, collection methods, and number of samples.

1. A water system that fails to meet the lead or copper action level on the basis of routine tap samples collected in accordance with Section 391-3-5-.25(7) shall collect lead and copper source water samples in accordance with the requirements regarding sample location, number of samples, and collection methods specified in 40 CFR, Part 141.88(a)(1)(i)-(iv) and (A)-(B).

2. Where the results of sampling indicate an exceedance of maximum permissible source water levels established under Section 391- 3-5-.25(4)(b)4., the Division may require that one additional sample be collected as soon as possible after the initial sample was taken (but not to exceed two weeks) at the same sampling point. If a Division-required confirmation sample is taken for lead or copper, then the results of the initial and confirmation sample shall be averaged in determining compliance with the Division-specified maximum permissible levels. Any sample value below the detection limit shall be considered to be zero. Any value above the detection limit but below the PQL (Practical Quantitation Limit) shall either be considered as the measured value or be considered one-half the PQL.

(b) Monitoring frequency after system exceeds tap water action level. Any system that exceeds the lead or copper action level during routine tap water monitoring shall collect one source water sample from each entry point to the distribution system no later than six months after the end of the monitoring period during which the action level was exceeded. For monitoring periods that are annual or less frequent, the end of the monitoring period is September 30 of the calendar year in which sampling occurs, or if the Division has established an alternate monitoring period, the last day of that period.

(c) Monitoring frequency after installation of source water treatment. Any system which installs source water treatment pursuant to Section 391-3-5-.25(4)(a)2. shall collect an additional

source water sample from each entry point to the distribution system during two consecutive six-month monitoring periods by the deadline specified in Section 391-3-5-.25(4)(a)4.

(d) Monitoring frequency after Division specifies maximum permissible source water levels or determines that source water treatment is not needed.

1. A system shall monitor at the frequency specified below in cases where the Division specifies maximum permissible source water levels under Section 391-3-5-.25(4)(b)4. or determines that the system is not required to install source water treatment under Section 391-3-5-.25(4)(b)2.

(i) A water system using only groundwater shall collect samples once during the three-year compliance period (as that term is defined in Section 391-3-5-.02) in effect when the applicable Division determination under paragraph (d)1. of this section is made. Such systems shall collect samples once during each subsequent compliance period. Triennial samples shall be collected every third year.

(ii) A water system using surface water (or a combination of surface and groundwater) shall collect samples once during each year, the first annual monitoring period to begin during the year in which the applicable Division determination is made under paragraph (d)1. of this section.

2. A system is not required to conduct source water sampling for lead and/or copper if the system meets the action level for the specific contaminant in tap water samples during the entire source water sampling period applicable to the system under paragraph (d)1.(i) or (ii) of this section.

(e) Reduced monitoring frequency.

1. A water system using only ground water may reduce the monitoring frequency for lead and copper in source water to once during each nine-year compliance cycle, as is defined in 40 CFR, Part 141.2, provided the samples are collected no later than every

ninth year and if the system meets one of the following:

(i) The system demonstrates that finished drinking water entering the distribution system has been maintained below the maximum permissible lead and copper concentrations specified by the Division under Rule 391-3-5-.25(1)(c) during at least three consecutive compliance periods under paragraph (d)1. of this section; or

(ii) The Division has determined that source water treatment is not needed and the system demonstrates that, at least three consecutive compliance periods in which sampling was conducted under paragraph (d)1. of this section, the concentration of lead in source water was less than or equal to 0.005 mg/L and the concentration of copper in source water was less than or equal to 0.65 mg/L.

2. A water system using surface water or a combination of surface and groundwater may reduce the monitoring frequency in paragraph (d)1. of this section to once during each nine-year compliance cycle, as is defined in 40 CFR, Part 141.2, provided the samples are collected no later than every ninth year and if the system meets one of the following:

(i) The system demonstrates that finished drinking water entering the distribution system has been maintained below the maximum permissible lead and copper concentrations specified by the Division under Rule 391-3-5-.25(1)(c) during at least three consecutive years; or

(ii) The Division has determined that source water treatment is not needed and the system demonstrates that, for at least three consecutive years, the concentration of lead in source water was less than or equal to 0.005 mg/L and the concentration of copper in source water was less than or equal to 0.65 mg/L.

3. A water system that uses a new source of water is not eligible for reduced monitoring for lead and/or copper until concentrations in samples collected from the new source during three consecutive monitoring periods are below the maximum permissible lead and copper concentrations specified in Section 391-3-5-.25(4)(a)5.

(10) **Analytical Methods.** Analyses for lead, copper, pH, conductivity, calcium, alkalinity, orthophosphate, silica, and temperature shall be conducted in accordance with 40 CFR, Part 141.89.

(11) **Reporting Requirements.** All water systems shall report all information to the Division in accordance with 40 CFR, Part 141.90.

(12) **Record Keeping Requirements.** All systems subject to the requirements of this section shall retain on its premises original records of all sampling data and analyses, reports, surveys, letters, evaluations, schedules, Division determinations, and any other information required in accordance with 40 CFR, Part 141.91.

(13) **Treatment Techniques.**

(a) These regulations establish treatment techniques in lieu of maximum contaminant levels for acrylamide and epichlorohydrin.

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

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

2. Epichlorohydrin = 0.01% dosed at 20 ppm (or equivalent); certifications can rely on manufacturers or third parties, as approved by the Division.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History**. Original Rule entitled "Reporting Requirements" adopted F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Amended**: F. July 15, 1983; eff. Aug. 4, 1983. **Repealed**: New Rule entitled "Volatile Synthetic Organic Chemical Sampling and Analytical Requirements" adopted. F. May 12, 1989; eff. June 1, 1989. **Repealed**: New Rule of same title adopted. F. Dec. 4, 1990; eff. Dec. 24, 1990. Repealed: New Rule, entitled "Treatment Techniques, Lead and Copper Requirements" adopted. F. June 25, 1992;

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eff. July 15, 1992. Amended: F. Mar. 10, 1994; eff. Mar. 30, 1994. Amended: F. Sept. 26, 1997; eff. Oct. 16, 1997. Amended: F. June 8, 2001; eff. June 28, 2001. Amended: F. Dec. 21, 2004; eff. Jan. 10, 2005. Amended: F. May 27, 2009; eff. June 16, 2009. Amended: New title "Treatment Techniques, Lead and Copper Requirements. Amended." F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.26 Unregulated Contaminants Sampling and Analytical Requirements. Amended.

(1) **Contaminant Monitoring.** Monitoring of the contaminants listed below in this section shall be conducted as follows:

(a) All community and non-transient, non-community water systems shall monitor for the contaminants listed in paragraphs (e) and (f) of this section by the date specified in Table 1. Systems serving 10,000 or fewer persons are not required to monitor for the contaminants in this section after December 31, 1998.

 TABLE 1 - MONITORING SCHEDULE BY SYSTEM SIZE

Population Served	Monitoring to Begin No Later Than
Over 10,000	January 1, 1993
3,300 to 10,000	January 1, 1994
Less than 3,300	January 1, 1996

(b) Surface water systems shall sample at points in the distribution system representative of each water source or at entry points to the distribution system after application of treatment. The minimum number of samples is one year of quarterly samples per water source.

(c) Ground water systems shall sample at points of entry to the distribution system representative of each well after any application of treatment. The minimum number of samples is one sample per entry point to the distribution system.

(d) The Division may require confirmation samples for positive or negative results.

(e) Group III Unregulated Volatile Organic Contaminants.

Group III Unregulated Volatile Organic
Contaminants
Chloroform
Bromodichloromethane
Chlorodibromomethane
Bromoform
Dibromomethane
m-Dichlorobenzene
1,1-Dichloropropene
1,1-Dichloroethane
1,1,2,2-Tetrachloroethane
1,3-Dichloropropane
Chloromethane
Bromomethane
1,2,3-Trichloropropane
1,1,1,2-Tetrachloroethane
Chloroethane
2,2-Dichloropropane
o-Chlorotoluene
p-Chlorotoluene
Bromobenzene
1,3-Dichloropropene

(f) Group IV Unregulated Volatile Organic Contaminants.

Group Contam	IV inants	Unregulated	Volatile	Organic
1,2,4-Tri	methyll	penzene		
1,2,3-Tri	chlorob	enzene		
n-Propyl	benzen	e		
n-Butylb	enzene			
Naphthal	ene			
Hexachle	orobuta	diene		

1,3,5-Trimethylbenzene
p-Isopropyltoluene
Isopropylbenzene
Tert-butylbenzene
Sec-butylbenzene
Fluorotrichloromethane
Dichlorofluoromethane
Bromochloromethane

(g) Instead of performing the monitoring required by this section, a community water system or non-transient non-community water system serving fewer than 150 service connections may send a letter to the Division stating that the system is available for sampling. This letter must be sent to the Division by January 1, 1994. The system shall not send such samples to the Division, unless requested to do so by the Division.

(h) All community and non-transient, non-community water systems shall repeat the monitoring required in Section 391-3-5-.26(1) no less than every five (5) years from the dates specified in Section 391-3-5-.26(1)(a).

(i) The Division may allow the public water system to composite up to five samples when monitoring for substances listed in Section 391-3-5-.26(1)(e) and (f).

(j) Analysis under this section shall only be conducted by laboratories certified by the Division in accordance with Section 391-3-5-.29.

(2) **Unregulated Contaminant Monitoring.** Monitoring of the contaminants listed in paragraphs (2)(k) and (2)(l) shall be conducted as follows:

(a) Each community and non-transient, non-community water system shall take four consecutive quarterly samples at each sampling point for each contaminant listed in paragraph (2)(k) of this section and report the results to the Division. Monitoring must be completed by December 31, 1995.

(b) Each community and non-transient non-community water system shall take one sample at each sampling point for each contaminant listed in paragraph (2)(1) of this section and report the results to the Division. Monitoring must be completed by December 31, 1995.

(c) Each community and non-transient non-community water system may apply to the Division for a waiver from the requirements of paragraph (2)(a) and (b) of this section.

(d) The Division may grant a waiver for the requirement of paragraph (2)(a) of this section based on the criteria specified in Section 391-3-5-.22(3)(f). The Division may grant a waiver from the requirement of paragraph (2)(b) of this section if previous analytical results indicate contamination would not occur, provided this data was collected after January 1, 1990.

(e) Groundwater systems shall take a minimum of one sample at every entry point to the distribution system which is representative of each well after treatment (hereafter called a sampling point). Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant.

(f) Surface water systems shall take a minimum of one sample at points in the distribution system that are representative of each source or at each entry point to the distribution system after treatment (hereafter called a sampling point.) Each sample must be taken at the same sampling point unless conditions make another sampling point more representative of each source or treatment plant. [Note: For purposes of this paragraph, surface water systems include systems with a combination of surface and ground sources.]

(g) If the system draws water from more than one source and the sources are combined before distribution, the system must sample at an entry point to the distribution system during periods of

normal operating conditions (i.e., when water representative of all sources is being used).

(h) The Division may require a confirmation sample for positive or negative results.

(i) The Division may reduce the total number of samples a system must analyze by allowing the use of compositing. Composite samples from a maximum of five sampling points are allowed. Compositing of samples must be done in the laboratory and the composite sample must be analyzed within 14 days of collection. If the population served by the system is greater than 3,300 persons, then compositing may only be permitted by the Division at sampling points within a single system. In systems serving fewer than or equal to 3,300 persons, the Division may permit compositing among different systems provided the 5-sample limit is maintained.

(j) Instead of performing the monitoring required by this section, a community water system or non-transient non-community water system serving fewer than 150 service connections may send a letter to the Division stating that the system is available for sampling. This letter must be sent to the Division by January 1, 1994. The system shall not send such samples to the Division, unless requested to do so by the Division.

(k) Listed below are the unregulated organic contaminants. The analytical method shall be in accordance with 40 CFR, Part 141.40.

Unregulated Organic Contaminants
Aldrin
Butachlor
Carbaryl
Dicamba
Dieldrin
3-Hydroxycarbofuran

Methomyl
Metolachlor
Metribuzin
Propachlor

(l) Listed below are the unregulated inorganic contaminants. The analytical method shall be in accordance with 40 CFR, Part 141.40:

Unregulated Inorganic Contaminants	
Sulfate	

(m) Analysis under this section shall only be conducted by laboratories certified by the Division.

(3) **Special Monitoring for Sodium.**

(a) Suppliers of water for community public water systems shall collect and analyze one sample per plant at the entry point of the distribution system for the determination of sodium concentration levels; samples must be collected and analyzed annually for systems utilizing surface water sources in whole or in part, and at least every three years for systems utilizing solely ground water sources. The minimum number of samples required to be taken by the system shall be based on the number of treatment plants used by the system, except that multiple wells drawing raw water from a single aquifer may, with the Division approval, be considered one treatment plant for determining the minimum number of samples. The supplier of water may be required by the Division to collect and analyze water samples for sodium more frequently in locations where the sodium content is variable.

(b) The supplier of water shall report to the Division the results of the analyses for sodium within the first 10 days of the month following the month in which the sample results were received or within the first 10 days following the end of the required monitoring period as stipulated by the Division, whichever of these is first, unless such analysis is performed by the Division. If more than annual sampling is required the supplier shall report the average sodium concentration within 10 days of the month following the month in which the analytical results of the last sample used for the annual average was received.

(c) The supplier of water shall notify appropriate local and state public health officials of the sodium levels by written notice by direct mail within three months. A copy of each notice required to be provided by this paragraph shall be sent to the Division within 10 days of its issuance. The supplier of water is not required to notify appropriate local and state public health officials of the sodium levels where the Division provides such notices in lieu of the supplier.

(d) Analyses for sodium shall be performed in accordance with the Federal Regulations 40 CFR, Part 141.41(d) procedures.

(e) Initial analyses for sodium for new community public water systems shall be completed within one year from the effective date of the permit to operate.

(4) Special Monitoring for Corrosivity Characteristics.

(a) Suppliers of water for community public water systems when required by the Division shall collect samples from a representative entry point to the water distribution system for the purpose of analysis to determine the corrosivity characteristics of the water.

1. The supplier shall collect two samples per plant for analysis for each plant using surface water sources wholly or in part or more if required by the Division one during mid-winter and one during midsummer. The supplier of the water shall collect one sample per plant for analysis for each plant using ground water sources or more if required by the Division. The minimum number of samples required to be taken by the system shall be based on the number of treatment plants used by the system, except that multiple wells drawing raw water from a single aquifer may, with the Division approval, be considered one treatment plant for determining the minimum number of samples.

2. Determination of the corrosivity characteristics of the water shall include measurement of pH, calcium, hardness, alkalinity, temperature, total dissolved solids (total filterable residue), and calculation of the Langelier Index in accordance with subparagraph (c) below. The determination of corrosivity characteristics shall only include one round of sampling (two samples per plant for surface water and one sample per plant for ground water sources). However, the Division has the discretion to require monitoring for additional parameters which may indicate corrosivity characteristics, such as sulfates and chlorides. In certain cases, the Aggressive Index, as described in subparagraph (c), can be used instead of the Langelier Index; the supplier shall request in writing to the Division and the Division will make this determination.

(b) The supplier of water shall report to the Division the results of the analyses for the corrosivity characteristics within the first 10 days of the month following the month in which the sample results were received, unless the analysis is conducted by the Division. If more frequent sampling is required by the Division, the supplier can accumulate the data and shall report each value within 10 days of the month following the month in which the analytical results of the last sample was received.

(c) Analyses conducted to determine the corrosivity of the water shall be made in accordance with 40 CFR Part 141.42(c).

(d) When required by the Division, the supplier of water for community and non-transient, non-community public water systems shall implement a corrosion control program satisfactory to the Division to insure that the drinking water is not unduly corrosive.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Public Notification" adopted F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-

^{5-.47.} Amended: F. July 15, 1983; eff. Aug. 4, 1983. **Repealed:** New Rule entitled "Sodium and Corrosion Control" adopted. F. May 12, 1989; eff. June 1, 1989. **Repealed:** New Rule entitled "Unregulated Contaminants Sampling and Analytical Requirements" adopted. F. June 25, 1992; eff. July 15, 1992. **Amended:** F. Mar. 10, 1994; eff. Mar. 30, 1994. **Amended:** F. Sept. 24, 1999; eff. Oct. 14, 1999. **Amended:** F. June 8, 2001; eff. June 28, 2001. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.27 Monitoring Frequency and Analytical Methods for Radioactivity in Community Water Systems. Amended.

(1) Monitoring Requirements for Gross Alpha Particle Activity, Radium-226 and Radium-228.

(a) Compliance with paragraph (5) of Rule 391-3-5-.18 shall be based on the analysis of an annual composite of four consecutive quarterly samples or the average of the analyses of four samples obtained at quarterly intervals.

1. A gross alpha particle activity measurement may be substituted for the required Radium-226 and Radium-228 analysis provided that the measured gross alpha particle activity does not exceed 5 pCi/L, at a confidence level of 95 percent (1.65 σ , where σ [sigma] is the standard deviation of the net counting rate of the sample). In localities where Radium-228 may be present in drinking water, Radium-226 and/or Radium-228 analyses are required when the gross alpha particle activity exceeds 2 pCi/L.

2. When the gross alpha particle activity exceeds 5 pCi/L, the same or an equivalent sample shall be analyzed for Radium-226. If the concentration of Radium-226 exceeds 3 pCi/L the same or an equivalent sample shall be analyzed for Radium-228.

(b) The initial analysis required by subparagraph (1)(a) of this section for new water systems shall be completed within two years from the effective date of the permit to operate.

(c) Suppliers of water shall monitor at least once every four years following the procedure required by subparagraph (1)(a) of this Section. At the discretion of the Director when an annual record taken in conformance with subparagraph (1)(a) of this Section has established that the average annual concentration is less than half the maximum contaminant levels established by paragraph (6) of Section 391-3-5-.18, analysis of a single sample may be substituted for the quarterly sampling procedure required by subparagraph (1)(a) of this Section.

1. More frequent monitoring shall be conducted when ordered by the Director in the vicinity of mining or other operations which may contribute alpha particle radioactivity to either surface or ground water sources of drinking water.

2. A supplier of water shall monitor in conformance with subparagraph (1)(a) of this Section within one year of the introduction of a new water source for a community water system. More frequent monitoring shall be conducted when ordered by the Director in the event of possible contamination or when changes in the distribution system or treatment process occur which may increase the concentration of radioactivity in drinking water.

3. A community water system using two or more sources having different concentrations of radioactivity shall monitor each source of water, in addition to water from a free flowing drinking water tap, when ordered by the Director.

4. Monitoring for compliance with paragraph (5) of Section 391-3-5-.18 after the initial period need not include Radium-228 except when required by the Director provided, that the average annual concentration of Radium-228 has been assayed at least once using the quarterly sampling procedure required by subparagraph (1)(a) of this Section.

5. Suppliers of water shall conduct annual monitoring of any community water system in which the Radium-228 concentration exceeds 3 pCi/L, as ordered by the Director.

(d) If the average annual maximum contaminant level for gross alpha particle activity or total radium as set forth in paragraph (5) of Section 391-3-5-.18 is exceeded, the supplier of a community water system shall give notice to the Division pursuant to Section 391-3-5-.30 and notify the public pursuant to Section 391-3-5-.32. Monitoring at quarterly intervals shall be continued until the annual average concentration no longer exceeds the maximum contaminant level or until a monitoring schedule as a condition to a permit, variance, exemption or enforcement action shall become effective.

(2) Monitoring Requirements for Man-made Radioactivity in Community Water Systems.

(a) Within two years following June 24, 1977 systems using surface water sources and serving more than 100,000 persons and such other community water systems as are designated by the Division shall be monitored for compliance with paragraph (5) of Section 391- 3-5-.18 by analysis of a composite of four consecutive quarterly samples or analysis of four quarterly samples. Compliance with paragraph (5) of Section 391-3-5-.18 may be assumed without further analysis if the average annual concentrations of tritium and strontium- 90 are less than those listed in Table A, provided, that in no case shall the sum of their annual dose equivalents to bone marrow exceed 4 milligrams per year.

1. If the gross beta particle activity exceeds 50 pCi/L, an analysis of the sample must be performed to identify the major radioactive constituents present and the appropriate organ and total body doses shall be calculated to determine compliance with paragraph (5) of Section 391-3-5-.18.

2. Suppliers of water shall conduct additional monitoring, as ordered by the Director, to determine the concentration of manmade radioactivity in principal watersheds designated by the Division.

3. At the discretion of the Director suppliers of water utilizing only ground waters may be required to monitor for man-made radioactivity.

(b) After the initial analysis required by subparagraph (2)(a) of this Section suppliers of water shall monitor at least every four years following the procedure given in subparagraph (2)(a) of this Section.

(c) Within two years of June 24, 1977 the supplier of any community water system designated by the Division as utilizing waters contaminated by effluents from nuclear facilities shall initiate quarterly monitoring for gross beta particle and iodine-131

radioactivity and annual monitoring for strontium-90 and tritium.

1. Quarterly monitoring for gross beta particle activity shall be based on the analysis of monthly samples or the analysis of a composite of three monthly samples. The former is recommended. If the gross beta particle activity in a sample exceeds 15 pCi/L, the same or an equivalent sample shall be analyzed for strontium-89 and cesium-134. If the gross beta particle activity exceeds 50 pCi/L, an analysis of the sample must be performed to identify the major radioactive constituents present and the appropriate organ and total body doses shall be calculated to determine compliance with paragraph (5) of Section 391-3-5-.18.

2. For iodine-131, a composite of five consecutive daily samples shall be analyzed once each quarter. As ordered by the Director, more frequent monitoring shall be conducted when iodine-131 is identified in the drinking water.

3. Annual monitoring for strontium-90 and tritium shall be conducted by means of the analysis of a composite of four consecutive quarterly samples or analysis of four quarterly samples. The latter procedure is recommended.

4. The Division may allow the substitution of environmental surveillance data taken in conjunction with a nuclear facility for direct monitoring of man-made radioactivity by the supplier of water where the Division determines such data is applicable to a particular community water system.

(d) If the average annual maximum contaminant level for manmade radioactivity set forth in paragraph (5) of Section 391-3-5-.18 is exceeded, the operator of a community water system shall give notice to the Division pursuant to Section 391-3-5-.30 and to the public as required by Section 391-3-5-.32. Monitoring at monthly intervals shall be continued until the concentration no longer exceeds the maximum contaminant level or until a monitoring schedule as a condition to a permit, variance, exemption or enforcement action shall become effective. (3) **Sample Collection and Analysis.** Upon written direction of the Director the supplier shall collect and submit drinking water samples for analysis in accordance with the schedule furnished.

(4) **Analytical Methods.** Analytical methods for measurement of radioactivity shall be in accordance with 40 CFR, Part 141.25.

(5) **Monitoring Requirements Effective December 7, 2003.** All existing community water systems (CWSs) must conduct initial monitoring to determine compliance with this section between December 7, 2003 and December 31, 2007. CWSs must sample each entry point to the distribution system for four consecutive quarters.

(6) **New Sources.** All new CWSs or CWSs that use a new source of water shall begin to conduct initial monitoring within the first quarter after initiating use of the source.

(7) **Initial Monitoring Waiver.** For gross alpha particle activity, uranium, radium-226, and radium-228 monitoring, the Division may waive the final two quarters of initial monitoring for a sampling point if the results of the samples from the previous two quarters are below the detection limit.

(8) **Initial Monitoring Above MCL.** If the average of the initial monitoring results for a sampling point is above the MCL, the system must collect and analyze quarterly samples at the sampling point until the system has results from four consecutive quarters that are at or below the MCL, unless the system enters into another schedule as part of a formal compliance agreement with the Division.

(9) **Reduced Monitoring.** The Division may allow community water systems to reduce the future frequency of monitoring from one every three years to once every six or nine years at each sampling point, based on the following criteria:

(a) If the average of the initial monitoring results for each contaminant (i.e., gross alpha particle activity, uranium, radium-226, or radium-228) is below the detection limit specified in Table

B, in Sec. 141.25(c)(1), the system must collect and analyze for that contaminant using at least one sample at the sampling point every nine years.

(b) For gross alpha particle activity and uranium, if the average of the initial monitoring results for each contaminant is at or above the detection limit but at or below half (1/2) the MCL, the system must collect and analyze for that contaminant using at least one sample at that sampling point every six years. For combined radium-226 and radium-228, the analytical results must be combined. If the average of the combined initial monitoring results for radium-226 and radium-228 is at or above the detection limit but at or below half (1/2) the MCL, the system must collect and analyze for that contaminant using at least one sample at that sampling point every six years.

(c) For gross alpha particle activity and uranium, if the average of the initial monitoring results for each contaminant is above half (1/2) the MCL but at or below the MCL, the system must collect and analyze at least one sample at that sampling point every three years. For combined radium-226 and radium-228, the analytical results must be combined. If the average of the combined initial monitoring results for radium-226 and radium-228 is above half (1/2) the MCL but at or below the MCL, the system must collect and analyze at least one sample at that sampling point every three years.

(d) Systems must use the samples collected during the reduced monitoring period to determine the monitoring frequency for subsequent monitoring periods, (e.g., if a system's sampling point is on a nine year monitoring period, and the sample result is above half (1/2) MCL, then the next monitoring period for that sampling point is three years).

(e) If a system has a monitoring result that exceeds the MCL while on reduced monitoring, the system must collect and analyze quarterly samples at that sampling point until the system has results from four consecutive quarters that are below the MCL,

unless the system enters into another schedule as part of a formal compliance agreement with the Division.

(10) **Compositing.** To fulfill quarterly monitoring requirements for gross alpha particle activity, radium-226, radium-228, or uranium, a system may composite up to four consecutive quarterly samples from a single entry point if analysis is done within a year of the first sample. The Division will treat analytical results from the composited as the average analytical result to determine compliance with the MCLs and the future monitoring frequency. If the analytical result from the composited sample is greater than half (1/2) MCL, the Division may direct the system to take additional quarterly samples before allowing the system to sample under a reduced monitoring schedule.

(11) **Gross Alpha Particle Activity.** A gross alpha particle activity measurement may be substituted for the required radium-226 measurement provided that the measured gross alpha particle activity does not exceed 5 pCi/L. A gross alpha particle activity measurement may be substituted for the required uranium measurement provided that the measured gross alpha particle activity does not exceed 15 pCi/L.

(12) Monitoring and Compliance Requirements for Beta Particle and Photon Radioactivity. To determine compliance with the maximum contaminant levels in CFR Sec. 141.66(d) for beta particle and photon radioactivity, a system must monitor at a frequency as follows:

(a) Community water systems (both surface and ground water) designated by the Division as vulnerable must sample for beta particle and photon radioactivity. Systems must collect quarterly samples for both beta emitters and annual samples for tritium and strontium-90 at each entry point to the distribution system (hereafter called a sampling point), beginning within one quarter after being notified by the Division. Systems already designated by the Division must continue to sample until the Division reviews and either reaffirms or removes the designation.

1. If the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity at a sampling point has a running annual average (computed quarterly) less than or equal to 50 pCi/L (screening level), the Division may reduce the frequency of monitoring at that sampling point to once every 3 years. Systems must collect all samples required in paragraph (b)(1) of this section during the reduced monitoring period.

2. For systems in the vicinity of a nuclear facility, the Division may allow the CWS to utilize environmental surveillance data collected by the nuclear facility in lieu of monitoring at the system's entry point(s), where the Division determines if such data is applicable to a particular water system. In the event that there is a release from a nuclear facility, systems which are using surveillance data must begin monitoring at the community water system's entry point(s) in accordance with paragraph (b)(1) of this section.

(b) Community water systems (both surface and ground water) designated by the Division as utilizing waters contaminated by effluents from nuclear facilities must sample for beta particle and photon radioactivity. Systems must collect quarterly samples for beta emitters and iodine-131 and annual samples for tritium and strontium-90 at each entry point to the distribution system (hereafter called a sampling point), beginning within one quarter after being notified by the Division. Systems already designated by the Division as systems using waters contaminated by effluents from nuclear facilities must continue to sample until the Division reviews and either reaffirms or removes the designation.

1. Quarterly monitoring for gross beta particle activity shall be based on the analysis of monthly samples or the analysis of a composite of three monthly samples. The former is recommended.

2. For iodine-131, a composite of five consecutive daily samples shall be analyzed once each quarter. As ordered by the Division, more frequent monitoring shall be conducted when iodine-131 is identified in the finished water.

3. Annual monitoring for strontium-90 and tritium shall be conducted by means of the analysis of a composite of four consecutive quarterly samples or analysis of four quarterly samples. The latter procedure is recommended.

4. If the gross beta particle activity beta minus the naturally occurring potassium-40 beta particle activity at a sampling point has a running annual average (computed quarterly) less than or equal to 15 pCi/L, the Division may reduce the frequency of monitoring at that sampling point to every 3 years. Systems must collect all samples required in paragraph (b)(2) of this section during the reduced monitoring period.

5. For systems in the vicinity of a nuclear facility, the Division may allow the CWS to utilize environmental surveillance data collected by the nuclear facility in lieu of monitoring at the system's entry point(s), where the Division determines if such data is applicable to a particular water system. In the event that there is a release from a nuclear facility, systems which are using surveillance data must begin monitoring at the community water system's entry point(s) in accordance with paragraph (b)(2) of this section.

(c) Community water systems designated by the Division to monitor for beta particle activity and photon radioactivity cannot apply to the Division for a waiver from the monitoring frequencies specified in paragraphs (b)(1) or (b)(2) of this section.

(d) Community water systems may analyze for naturally occurring potassium-40 beta particle activity from the same or equivalent sample used for the gross beta particle activity analysis. Systems are allowed to subtract the potassium-40 beta particle activity value from the total gross beta particle activity value to determine if the screening level is exceeded. The potassium-40 beta particle activity must be calculated by multiplying elemental potassium concentrations (in mg/L) by a factor of 0.82.

(e) If the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity exceeds the screening level, an

analysis of the sample must be performed to identify the major radioactive constituents present in the sample and the appropriate doses must be calculated and summed to determine compliance with Sec. 141.66(d)(1), using the formula in Sec. 141.66(d)(2). Doses must also be calculated and combined for measured levels of tritium and strontium to determine compliance.

(13) **Monthly Sampling.** Systems must monitor monthly at the sampling point(s) which exceed the maximum contaminant level in Sec. 141.66(d) beginning the month after the exceedance occurs. Systems must continue monthly monitoring until the system has established, by a rolling average of 3 monthly samples, that the MCL is being met. Systems who establish that the MCL is being met must return to quarterly monitoring until they meet the requirements set forth in paragraph (b)(1)(ii) or (b)(2)(i) of this section.

(14) **Running Annual Average.** For systems monitoring more than once per year, compliance with the MCL is determined by a running annual average at each sampling point. If the average of any sampling point is greater than the MCL, then the system is out of compliance with the MCL.

(15) **Exceeding MCL.** For systems monitoring more than once per year, if any sample result will cause the running average to exceed the MCL at any sample point, the system is out of compliance with the MCL immediately.

(16) **Running Annual Average Calculation.** If a system does not collect all required samples when compliance is based on a running annual average of quarterly samples, compliance will be based on the running average of the samples collected.

(17) **Detection Limit and Running Annual Average Calculation.** If a sample result is less than the detection limit, zero will be used to calculate the annual average, unless a gross alpha particle activity is being used in lieu of radium-226 and/or uranium. If the gross alpha particle activity result is less than detection, half (1/2) the detection limit will be used to calculate the annual average.

(18) **MCLGs**. The Maximum Contaminant Level Goal (MCLG) for Combined radium-226 and radium-228, Gross alpha particle activity, Beta particle and photon radioactivity, and uranium is zero.

(19) **MCLs.** The Maximum Contaminant Level (MCL) for radioactive particles is as follows:

(a) MCL for combined radium-226 and radium-228. The maximum contaminant level for combined radium-226 and radium-228 is 5 pCi/L. The combined radium-226 and radium-228 value is determined by the addition of the results of the analysis for radium-226 and the analysis for radium-228.

(b) MCL for gross alpha particle activity (excluding radon and uranium). The maximum contaminant level for gross alpha particle activity (including radium-226 but excluding radon and uranium) is 15 pCi/L.

(c) MCL for beta particle and photon radioactivity. The average annual concentration of beta particle and photon radioactivity from man-made radionuclides in drinking water must not produce an annual dose equivalent to the total body or any internal organ greater than four millirem per year (4 mrem/yr).

(d) MCL for uranium. The maximum contaminant level for uranium is $30 \mu g/L$.

Authority O.C.G.A. Sec. 12-5-170 et seq. **History.** Original Rule entitled "Secondary Maximum Contaminant Levels for Drinking Water" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Repealed:** New Rule of the same title adopted. F. July 15, 1983; eff. Aug. 4, 1983. **Repealed:** New Rule entitled "Monitoring Frequency and Analytical Methods for Radioactivity in Community Water Systems" adopted. F. May 12, 1989; eff. June 1, 1989. **Amended:** F. Dec. 4, 1990; eff. Dec. 24, 1990. **Amended:** F. Sept. 26, 1997; eff. Oct. 16, 1997. **Amended:** F. June 8, 2001; eff. June 28, 2001. **Amended:** F. Dec. 10, 2002; eff. Dec. 30, 2002. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.28 Alternative Analytical Techniques. Amended.

With the written permission of the Director, concurred in by the administrator of the U.S. Environmental Protection Agency, an alternative analytical technique may be employed. An alternative technique shall be acceptable only if it is accuracy as it relates to the determination of compliance with any maximum contaminant level. The use of the alternative analytical techniques shall not decrease the frequency of monitoring required by these rules, in accordance with 40 CFR, Part 141.27.

Authority Ga. L. 1977, p. 351, *et seq.*, O.C.G.A. Sec. 12-5-170 *et seq.*, as amended. **History.** Original Rule entitled "Maximum Contaminant Levels for Radium-226, Radium-228, and Gross Alpha Particle Radioactivity in Community Water Systems" was filed on July 5, 1977; effective July 26, 1977, as specified by rule 391-3-5-.47. **Repealed:** New Rule entitled "Alternative Analytical Techniques" adopted. F. May 12, 1989; eff. Jun. 1, 1989. **Amended:** F. Sept. 26, 1997; eff. Oct. 16, 1997. **Amended:** New title "Alternative Analytical Techniques. Amended." F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.29 Certified Laboratories. Amended.

(1) **Laboratories Approved by the Division.** For the purpose of determining compliance with Rules 391-3-5-.18, .19, .20, .21, .22, .23, .24, .25, .26, .27 and .54, samples may be considered only if they have been analyzed by a laboratory approved by the Division, in accordance with 40 CFR, 141.28, except that measurements used solely for operational control, including but not limited to turbidity, free chlorine residual, fluoride residual, temperature, pH, conductivity, calcium, alkalinity, orthophosphate, and silica may be performed by any person acceptable to the Division.

(2) **Laboratory Personnel Changes.** All drinking water analysis laboratories certified by the Division must notify the Division of personnel changes within thirty (30) days from the time of the change.

(3) **Division-Collected Samples.** Nothing in this Chapter shall be construed to preclude the Division or any duly designated representative of the Division from taking samples or from using the results from such samples to determine compliance by a supplier of water with the applicable requirements of this Chapter.

Authority Ga. L. 1977, p. 351, *et seq.*, O.C.G.A. Sec. 12-5-170 *et seq.*, as amended. **History.** Original Rule entitled "Maximum Contaminant Levels for Beta Particle and Photon Radioactivity from Man-Made Radionuclides in Community Water Systems" was filed on July 5, 1977; effective July 26, 1977, as specified by Rule 391-3-5-.47. **Repealed:** New Rule entitled "Laboratory Approval" adopted. F. May 12, 1989; eff. Jun. 1, 1989. **Repealed:** New Rule, same title, adopted. F. Jun. 25, 1992; eff. Jul. 15, 1992. **Amended:** F. Mar. 10, 1994; eff. Mar. 30, 1994. **Amended:** Rule retitled "Certified Laboratories" adopted F. Sept. 26, 1997; eff. Oct. 16, 1997. **Amended:** F. May 27, 2009; eff. June 16, 2009. **Amended:** New title "Certified Laboratories. Amended." F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.30 Reporting Requirements. Amended.

(1) **Reporting Period.** Except where a shorter period is specified by the Director, the supplier of water shall report to the Division the results of any test measurement or analysis required by this Chapter within:

(a) the first ten days following the month in which the results are received; or

(b) the first ten days following the end of the required monitoring period as stipulated by the Division, whichever of these is shortest. Note: Test measurements and results should be reported on the Division's reporting forms. Copies of these forms can be found on the Division web page.

(2) **Violation.** Failure to comply with paragraphs (1)(a) and (b) of Rule 391-3- 5-.30 will result in a monitoring/reporting violation.

(3) **Analysis by Division Laboratory.** The supplier of water is not required to report analytical results to the Division in cases where the Division's laboratory performs the analysis and reports the results to the Division's office which would normally receive such notification from the supplier.

(4) **Analysis by Non-Division Laboratory.** The supplier of water is not required to report analytical results to the Division in cases where the Division's laboratory performs the analysis and reports the results to the Division's office, which would normally receive such notification from the supplier. When the Division's laboratory does not perform the analysis, and the supplier chooses to use a laboratory certified by the Division, analytical results shall be reported to the Division's office in a manner that is specified by the Division.

(5) **Records Maintained by Public Water System.** The water supply system shall submit to the Division within the time stated in the request copies of any records required to be maintained under Rule 391-3-5-.15 hereof or copies of any documents then in

existence which the Division is entitled to inspect pursuant to the authority of the Act.

(6) **Waterborne Disease Outbreak.** Each system, upon discovering that a waterborne disease outbreak potentially attributable to that water system has occurred, must report that occurrence to the Division by telephone within forty-eight (48) hours or before the end of the next business day, whichever is earlier, followed by a written report.

(7) **Lead and Copper Information.** All water systems shall report all lead and copper information in accordance with 40 CFR, Part 141.90 when applicable. Separate reports are required for each of the following:

1. tap water monitoring for lead and copper, and other water quality monitoring;

- 2. source water monitoring;
- 3. corrosion control treatment;
- 4. source water treatment;
- 5. lead service line replacement;
- 6. public education programs.
- (8) **Reserved.**

(9) **Disinfection Byproducts Information.** Systems monitoring for disinfection byproducts (TTHM, HAA5, chlorite, bromate) under the requirements of 40 CFR § 141.132(b) must report the information specified in section 40 CFR § 141.134(b).

(10) **Disinfectants Information.** Systems monitoring for disinfectants (chlorine, chloramines, chlorine dioxide) under the requirements of 40 CFR § 141.132(c) must report the information specified in Section 40 CFR § 141.134(c).

(11) **Disinfection Byproduct Precursors Information.** Systems monitoring for disinfection byproduct precursors (TOC) under the requirements of 40 CFR § 141.132(d) and required to meet the

enhanced coagulation or enhanced softening requirements in 141.135(b)(2) or (3) or meeting one or more of the alternative compliance criteria in 141.135(a)(2) or (3) must report the information specified in section 40 CFR § 141.134(d).

(12) Conventional or Direct Filtration Information for Systems Serving At Least 10,000 Persons. Beginning January 1, 2002, in addition to the requirement in this Chapter, the Subpart H water systems serving at least 10,000 people and providing conventional filtration treatment or direct filtration must report monthly to the Division the information specified in 40 CFR § 141.175(a) and (b). Those systems using filtration technologies other than conventional filtration treatment, direct filtration, slow sand filtration, or diatomaceous earth filtration must report monthly to the Division the information in 40 CFR § 141.175(a) in lieu of reporting in (b)(1).

(13) **Content of Consumer Confidence Reports.** 40 CFR § 141.153 is hereby incorporated by reference.

(14) **Filtration Information for Systems Serving Less Than 10,000 Persons.** In addition to the requirements in this Chapter, the Subpart H water systems serving fewer than 10,000 people must report the required items at the frequency described in 40 CFR Subpart T § 141.570.

(15) **Filter Backwash Information.** All subpart H systems that employ conventional filtration or direct filtration treatment and that recycle spent filter backwash water, thickener supernatant, or liquids from dewatering processes must report the information specified in 40 CFR § 141.76(b)(1) and (2) to the Division no later than December 8, 2003.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History:** Original Rule entitled "Analytical Methods for Radioactivity" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Repealed:** New Rule entitled "Reporting Requirements" adopted. F. May 12, 1989; eff. June 1, 1989. **Amended:** Dec. 4, 1990; eff. Dec. 24, 1990. **Amended:** F. June 25, 1992; eff. July 15, 1992.

Rules for Safe Drinking Water

Amended: F. Sept. 29, 2000; eff. Oct. 19, 2000. **Amended:** F. June 8, 2001; eff. June 28, 2001. **Amended:** F. Dec. 10, 2002; eff. Dec. 30, 2002. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.31 Monitoring of Consecutive Public Water Systems. Amended.

Purchased water systems may be monitored as consecutive systems with the consent of the system involved and the approval of the Director. Monitoring schedules and reporting procedures for consecutive water systems must be in the form and manner as specified by the Division.

Authority Ga. L. 1977, *et seq.*, O.C.G.A. Sec. 12-5-170 *et seq.*, as amended. **History:** Original Rule entitled "Monitoring Frequency for Radioactivity in Community Water System" was filed on July 5, 1977; effective July 26, 1977, as specified by Rule 391-3-5-.47. **Amended:** Filed July 15, 1983; effective August 4, 1983. **Repealed:** New Rule entitled "Monitoring of Consecutive Public Water Systems" adopted. F. May 12, 1989; eff. Jun. 1, 1989. **Repealed:** New Rule, same title, adopted. F. Jun. 25, 1992; eff. Jul. 15, 1992. **Amended:** New title "Monitoring of Consecutive Public Water Systems. Amended." F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.32 Public Notification. Amended.

(1) **Public Notification of Drinking Water Violations.** 40 CFR, Subpart Q §§ 141.201 through 141.210, including Appendices A, B and C to subpart Q of Part 141, is hereby incorporated by reference. Any amendments to any part of the appendices in 40 CFR, Subpart Q are hereby incorporated by reference. If a community or non-community water system fails to comply with an applicable primary maximum contaminant level established in Section 391-3-5-.18; fails to comply when applicable with the secondary maximum contaminant level for fluoride established in Section 391-3-5-.19; fails to comply with an applicable testing procedure established in Sections 391-3-5-.20, .21, .22, .23, .24, .25, or .27; is granted a variance or an exemption from an applicable maximum contaminant level; fails to comply with the requirements of any schedule prescribed pursuant to a variance or exemption; or fails to comply with any treatment technique requirement specified by the Director; or fails to perform any monitoring or reporting required pursuant to Sections 391-3-5-.20, .21, .22, .23, .24, .25, .26, .27 and .30; the supplier of water shall notify persons (including the mandatory health effects language) served by the system as required in 40 CFR, Parts 141, Subpart Q, 142.16(a). The public water system, within ten (10) days of completing the public notification requirements under 40 CFR, Parts 141, Subpart Q for the initial public notice and any repeat notices, must submit to the Division a certification that it has fully complied with the public notification regulations. The public water system must include with this certification a representative copy of each type of notice distributed, published, posted, and made available to the persons served by the system and to the media.

(2) **Public Notification of Lead Contamination.** The owner or operator of each community water system and each non-transient, non-community water system shall issue notice, in accordance with 40 CFR, Part 141.34, to persons served by the system that may be affected by lead contamination of their drinking water. The

owner or operator shall provide notice under this Section even if there is no violation of the national primary drinking water regulation for lead.

(3) **Public Notification of Unregulated Organic Chemical Monitoring.** The owner or operator of a community water system or non-transient, non-community water system who is required to monitor for unregulated organic chemicals in accordance with Section 391-3-5-.26 shall notify persons served by the system of the availability of the results of sampling in accordance with 40 CFR, Part 141.35.

(4) **Public Notification for Acute Health Risk MCL Violations.** For violations of the MCL of contaminants and MRDLs of disinfectants that may pose an acute risk to human health, a copy of the notice shall be furnished to radio and television stations serving the area served by the public water system as soon as possible but in no case later than seventy-two (72) hours after the violation.

(a) For violations of the MCL for total coliform, when fecal coliform or *E. coli* is detected or a failure to test for fecal coliform or *E. coli*, including *E. coli* in source water samples based on § 141.202(a) Table 1(8) and MRDs of disinfectants that may pose acute risk to human health, a copy of the notice shall be furnished to radio and television stations serving the area served by the public water system as soon as possible but in no case later than 24 hours after the violation.

(b) For violations of the MCL for total coliform, MRDs and treatment technique requirements taking in account potential health effects a copy of the notice must be provided by a daily or weekly newspaper as soon as possible but in no case later than 30 days of the violation as stated in § 141.203(a)(4). A copy must also be issued by direct mail, posting, or hand delivery as soon as possible but in no case later than 30 days of the violation.

(c) Tier 1 public notice in lieu of Tier 2 or Tier 3 is required for violations or situations listed in Table 1 of 40 CFR 141.202(a)(5),

(6), and (9) are hereby incorporated by reference.

1. Violation of the turbidity MCL under § 141.13(b), where the primacy agency determines after consultation that a Tier 1 notice is required or where consultation does not take place within 24 hours after the system learns of the violation;

2. Violation of the Surface Water Treatment Rule (SWTR), Interim Enhanced Surface Water Treatment Rule (IESWTR) or Long Term 1 Enhanced Surface Water Treatment Rule (LT1SWTR) treatment technique requirement resulting from a single exceedance of the maximum allowable turbidity limit.

3. Other violations or situations with significant potential to have serious adverse effects on human health as a result of short-term exposure, as determined by the primacy agency either in its regulations or on a case-by-case basis.

(5) **Provide Notice Prior to New Service.** The owner or operator of a community water system must give a copy of the most recent public notice for any outstanding violation of any maximum contaminant level, or any maximum residual disinfectant level, or any treatment technique requirement, or any variance or exemption schedule to all new billing units or new hookups prior to or at the time service begins.

(6) **Cryptosporidium Public Notice.** Special public notice for repeated failure to conduct monitoring of the source water for *Cryptosporidium* and for failure to determine bin classification or mean *Cryptosporidium* level: 40 CFR, Subpart Q § 141.211, in its entirety, including Appendix A, is hereby incorporated by reference. The specified mandatory language must be included in the special notice.

(7) **Non-Applicability.** Any reference to public notification requirements in 40 CFR 141.32 is not applicable.

Authority O.C.G.A. Sec. 12-5-170 et seq. History. Original Rule entitled "Requirements for a Variance" adopted. F. July 5, 1977; eff. July 26, 1977, as

specified by Rule 391-3-5-.47. **Repealed:** New Rule entitled "Public Notification" adopted. F. May 12, 1989; eff. June 1, 1989. **Amended:** F. Dec. 4, 1990; eff. Dec. 24, 1990. **Repealed:** New Rule of same title adopted. F. June 25, 1992; eff. July 15, 1992. **Amended:** F. Sept. 29, 2000; eff. Oct. 19, 2000. **Amended:** F. June 8, 2001; eff. June 28, 2001. **Amended:** F. Dec. 10, 2002; eff. Dec. 30, 2002. **Amended:** F. May 27, 2009; eff. June 16, 2009. **Amended:** New title "Public Notification. Amended." F. Jan 8, 2014; eff. Jan 28, 2014.

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391-3-5-.33 Variances and Exemptions. Amended.

Variances and exemptions from certain provisions of these regulations may be granted by the Director pursuant to O.C.G.A. Sec. 12-5-178 and 40 CFR § 141.4 and in the case of arsenic, 40 CFR § 142.20(b).

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Variance Request" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Repealed:** New Rule entitled "Variances and Exemptions" adopted. F. May 12, 1989; eff. June 1, 1989. **Amended:** F. Sept. 24, 1999; eff. Oct. 14, 1999. **Amended:** F. Dec. 10, 2002; eff. Dec. 30, 2002. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.34 Emergencies.

Whenever the Director finds that an emergency exist, presenting an imminent hazard to the public health, safety or welfare, requiring immediate action to protect the public health and to insure that the need for safe drinking water is met, he may, without notice or hearing, issue such order or orders as he deems necessary and appropriate to meet to emergency. Any such order shall cite the existence of an emergency and shall contain a brief statement of the reasons for his finding that an emergency exists. Such orders shall be immediately effective and any person affected thereby shall comply therewith immediately. Such orders shall, however, contain a notice of the time and place of a hearing scheduled within twenty (20) days from the issuance of such order before a Hearing Officer, appointed by the Department. Based upon the findings, of the Hearing Officer, the order shall be modified, revoked, or continued as the Hearing Officer deems appropriate.

Authority Ga. L. 1977, p. 351. *et seq.*, O.C.G.A. Sec. 12-5-170 *et seq.*, as amended. **History.** Original was filed on July 5, 1977; effective July 26, 1977, as specified by Rule 391-3-5-.47. **Repealed:** New Rule entitled "Emergencies" adopted. F. May 12, 1989; eff. Jun. 1, 1989. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.35 Inspections and Investigations.

(1) Access for Inspection or Investigation. The Director, or his appointed agent, shall be permitted access in or upon any private or public property at all reasonable times for the purpose of inspecting or investigating conditions, processes, equipment, methods, treatment, facilities, or records relating to or associated with the operation of any water system, to determine applicability of and compliance with the Act and these rules, to investigations as he deems advisable and necessary for the protection of the public health or welfare pursuant to the Act.

(2) **Issue Orders for Compliance.** Based on the Director's findings in any such inspection or investigation, or upon denial of entry pursuant to the above paragraph, the Director may issue such orders as are necessary to insure compliance with the Act and these rules.

Authority Ga. L. 1977, p. 351, *et seq.*, O.C.G.A. Sec. 12-5-170 *et seq.*, as amended. **History.** Original Rule was filed on July 5, 1977; effective July 26, 1977, as specified by Rule 391-3-5-.47. **Repealed:** New Rule entitled "Inspections and Investigations" adopted. F. May 12, 1989; eff. Jun. 1, 1989. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.36 Enforcement.

The administration and enforcement of these rules and regulations shall be in accordance with the Georgia Administrative Procedure Act. Such enforcement measures include, but are not limited to, administrative orders, court orders, injunctive relief, and civil and criminal penalties pursuant to the Act.

Authority Ga. L. 1977, p. 351 *et seq.*, O.C.G.A. Sec. 12-5-170 *et seq.*, as amended. **History.** Original Rule was filed on July 5, 1977; effective July 26, 1977, as specified by Rule 391-3-5-.47. **Repealed:** New Rule entitled "Enforcement" adopted. F. May 12, 1989; eff. Jun. 1, 1989. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.37 State Primacy Maintenance.

(1) Notwithstanding any other section, the requirements of these Safe Drinking Water Rules shall in any event be the same as the requirements of the National Primary Drinking Water Regulations in 40 CFR, Part 141 promulgated pursuant to Section 1412 of the Federal Act (42 U.S.C. 300g-1).

(2) The Director may prescribed more stringent requirements than those specified by any other section of these Safe Drinking Water Rules when necessary to:

- (a) meet any requirements of the Federal Act and Regulations; or
- (b) safeguard the public health, safety and welfare.

Authority Ga. L. 1977, p. 351, et seq., 12-5-170 et seq., as amended. **History.** Original Rule was filed on July 5, 1977; effective July 26, 1977, as specified by Rule 391-3-5-.47. **Repealed:** New Rule entitled "State Primacy Maintenance" adopted. F. May 12, 1989; eff. Jun. 1, 1989. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

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391-3-5-.38 Effective Date. Amended.

These rules shall become effective on July 26, 1977. Amendments shall become effective as provided by law.

Authority Ga. L. 1977, p. 351, *et seq.*, O.C.G.A. Sec. 12-5-170 *et seq.*, as amended. **History.** Original Rule was filed on July 5, 1977; effective July 26, 1977, as specified by Rule 391-3-5-.47 **Repealed:** New Rule entitled "Effective Date" adopted. F. May 12, 1989; eff. Jun. 1, 1989. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.39 Public Water System Classification. Amended.

(1) **Purpose.** In accordance with Section 10 of the Certification of Water and Wastewater Treatment Plant Operators and Laboratory Analysts Act (O.C.G.A. Section 43-51-1) the following classifications shall be considered as minimum levels, and the Division may classify any system or plant at a higher level if the complexity of the system or plant warrants such higher classification in the judgment of the Division. Any system or plant not fitting any of the following standard descriptions shall be classified individually according to the judgment of the Division. Where water is supplied to a distribution system from two or more sources, the classification may be set by the Division.

(2) **Minimum Classifications.** The following classifications shall be considered as minimum levels:

System Type	Class	Class	Class	Class
	Ι	II	ш	IV
Surface water with conventional treatment plant	5.0 MGD or greater	4.99 MGD or less	n/a	n/a
Surface water with package or non- conventional treatment plant	1.0 MGD or greater	0.99 MGD or less	n/a	n/a

Public Water System Classification for Community and Non-transient Non-community ${\rm Systems}^1$

System Type	Class	Class	Class	Class
	Ι	II	III	IV
Surface water with approved high-rate filtration	3.0 gpm/sq.ft. or greater	Less than 3.0 gpm/sq.ft.	n/a	n/a
Groundwater under the direct influence of surface water	1.0 MGD or greater	Greater than 0.1 MGD to 0.99 MGD	0.1 MGD or less	n/a
Groundwater	50,000 or greater population	10,000 to 49,999 population	1,000 to 9,999 pop- ulation	25 to 999 population
Distribution systems	Certification is required for the operator of public water distribution systems.			

Note: ¹ MGD is million gallons per day; gpm/sq.ft. is gallons per minute per square-foot filter surface area; n/a is not applicable.

(3) **Groundwater Transient Non-community Water Systems.** All Transient Non-community water systems with groundwater sources must have at least a Class IV operator certification.

(4) **Surface Water Transient Non-community Water Systems.** Certification of Transient Non-community water systems with surface water will be specified in their permit to operate a public water system.

(5) **Higher Classification.** When the complexity of water treatment warrants it, a higher classification may be required and

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specified in the permit to operate a public water system.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Consideration of an Exemption Request" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Repealed:** New Rule entitled "Public Water System Classification" adopted. F. May 12, 1989; eff. June 1, 1989. **Amended:** F. Sept. 26, 1997; eff. Oct. 16, 1997. **Amended:** F. Sept. 29, 2000; eff. Oct. 19, 2000. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.40 Wellhead Protection. Amended.

(1) **Purpose.** The following rule for wellhead protection serve to help protect wells and springs used as sources of water supply for community public water systems owned by and/or serving municipalities, counties, and authorities from nearby pollution sources.

(2) **Development of Wellhead Protection Plan.** The Division shall develop a Wellhead Protection Plan for every well, well field or spring which is used as a source for a community public water supply owned by and/or serving a municipality, county, or an authority.

(3) **Components of Wellhead Protection Plans.** Wellhead Protection Plans shall consist of five parts; namely:

(a) an identification and location of a Control Zone for each well or spring;

(b) an identification and location of each required Management Zone for each well or spring;

(c) an inventory of potential pollution sources in the designated wellhead protection areas;

(d) a management plan for potential pollution sources identified in the inventory; and

(e) if available, a contingency plan submitted by the supplier to the Division describing how alternate water supplies will be provided in case the well(s) in question become polluted. The Division shall develop all individual Wellhead Protection Plans consistent with the rules.

(4) **Wellhead Protection Zones.** Every Wellhead Protection Area shall consist of two zones, as follows:

(a) The Control Zone: Within this zone, the owner shall control all activities so that there are minimal sources of potential pollution in

the immediate vicinity of the well bore.

(b) The Management Zone: Within this zone, certain potential pollution sources are prohibited or certain activities must be performed in accordance with the rules listed below. The size and shape of the management zone will vary according to aquifer type, aquifer hydraulic conductivity, pumpage rate, hydrologic province, and proximity to recharge.

(5) **Control Zone.** All wells used as a source of public water supply for community public water systems owned by and/or serving municipalities, counties, or authorities shall have a control zone.

(6) **Delineation of Management Zone.** The Division shall delineate the size and shape of the management zone of a wellhead protection area as defined below:

(a) wells determined by the Division as drawing water only from confined aquifers shall have an inner management zone extending outward from the center of the borehole for a radius of 100 feet. No outer management zone is required for such wells.

(b) wells drawing water from unconfined aquifers as determined by the Division and springs, except those determined by the Division to lie in areas of karst, shall have an inner management zone extending outward from the center of the borehole or spring head for a radius of 250 feet.

(c) wells drawing water from unconfined aquifers as determined by the Division and springs, which the Division has identified as being in areas of karst, shall have an inner management zone extending outward from the center of the borehole or spring head for a radius of 500 feet.

(d) unconfined wells which the Division has determined utilize fractured crystalline rock aquifers shall have an outer management zone determined according to the "Health Method Curve" contained in the EPA approved Georgia Wellhead Protection Plan.

(e) unconfined aquifer wells determined by the Division as lying

in karst regions and all springs shall have an outer management zone determined by hydrogeologic mapping or other method acceptable to the Division.

(f) Other wells not meeting the above criteria shall have their outer management zones determined by time of travel calculations (a minimum of a 5-year time of travel) or by volumetric calculations as appropriate.

(7) **Inventory of Potential Pollution Sources.** The Division shall carry out an inventory of potential pollution sources within the control zone and management zones. Inventories shall be permanently maintained by the Division in computer data base format. Minimum information shall be the name and address of the owner of the well or spring, location of the well or spring, applicable permit data, the size and shape of the control and management zones, and the types of potential pollution sources. Inventories shall be carried out by the Division every ten (10) years.

(8) **Inner and Outer Management Zones.** Within the inner and outer management zones of existing wells and springs, the following shall apply:

(a) The Division shall not issue any new permits for municipal solid waste landfills, industrial waste landfills or construction/demolition waste landfills.

(b) The Division shall not issue any new permits for the land disposal of hazardous wastes.

(c) The Division shall require all new facilities permitted to handle, treat, store or dispose of hazardous waste or hazardous materials to perform such operations on an impermeable pad having a spill and leak collection system.

(d) The Division shall require all new agricultural waste impoundments to have an impermeable synthetic liner.

(e) The Division shall not issue any new permits for land application of wastewater or sludge.

(f) Deleted.

(g) The Division shall not issue permits for any new quarries or underground mines unless a hydrogeological investigation carried out by the applicant clearly demonstrates that operation of the quarry or mine will not pollute the well or spring or cause a reduction of ground water flow to the well or spring. Such investigation shall be performed by a professional engineer or professional geologist.

(h) The Division shall require that all new underground storage tanks installed shall meet the highest standards applicable under the Underground Storage Tank Act. All preexisting underground storage tanks shall be required to have ground water or vapor monitoring. All abandoned underground storage tanks shall meet the requirements of Section 391-3-15-.11 of the Rules for Underground Storage Tanks.

(i) The Division shall require all new wastewater treatment basins to have an impermeable synthetic liner.

(9) New Sources that are Wells or Springs. For new wells or springs that are to be used as a source of water supply for a community public water system owned by and/or serving a municipality, county, or authority the following shall apply:

(a) The Division shall not issue any permit for the addition of a new well or spring until the Division has delineated an appropriate wellhead protection area and carried out an inventory of potential pollution sources in the wellhead protection area of the proposed well or spring. The Division shall make provision for emergency situations.

(b) Once the owner and/or supplier requests the Divisions approval for the construction and/or development of a new well, well field, or spring, the Division shall require the Owner and/or supplier to provide the Division with the exact location, intended aquifer, projected depth and expected production of the planned well(s) or springs. (c) The Division shall not issue approval for the construction and/ or development of well or spring where the following potential pollution sources are known to be present within the inner management zone:

1. underground storage tanks;

2. non-domestic septic tanks with drain fields;

3. animal feedlots, poultry enclosures, or animal enclosures (this rule shall not be construed to apply to family pets);

4. Environmental facilities permitted by the Division or other potential pollution sources identified in the inventory unless the Division has determined that there will be no releases to the ground or that such releases, if they occur, will not be a threat to public health and safety. Domestic septic systems that are identified within the inner management zone shall be excluded from the requirements of this section, provided they are located in accordance with the criteria specified in Rule 391-3-5-.07 of this Chapter.

(10) **Notification.** The Division shall notify the owner of any regulated or unregulated chemicals which the Division believes, based on the potential pollution source inventory, may be present in the control zone or management zones of new or existing individual wells, well fields, or springs.

(11) **Underground Injection Wells.** Within the inner management zone of existing wells and springs, the Division shall not issue any new permits for underground injection wells, with the exception of remediation wells.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Disposition of an Exemption Request" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Repealed:** F. May 12, 1989, eff. June 1, 1989. **Amended:** New Rule entitled "Wellhead Protection" adopted. F. June 7, 1993; eff. June 27, 1993. **Amended:** F. Sept. 24, 1999; eff. Oct. 14, 1999. **Amended:** F. Sept. 29, 2000; eff. Oct. 19, 2000. **Amended:** F. Dec. 10, 2002; eff. Dec. 30, 2002. **Amended:** F. Dec. 21, 2004; eff. Jan. 10, 2005. **Amended:** F. Jan 8, 2014; eff. Jan

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28, 2014.

391-3-5-.41 Consumer Confidence Reports. Amended.

(1) **Purpose and Applicability.** 40 CFR, Subpart O § 141.151 is hereby incorporated by reference.

(2) **Effective Dates.**

(a) Each existing community water system must deliver to all its customers its first report by October 19, 1999, its second report by July 1, 2000, and subsequent reports by July 1 annually thereafter. The first report must contain data collected during, or prior to, calendar year 1998 as prescribed in 40 CFR, Subpart O § 141.153(d)(3). Each report thereafter must contain data collected during, or prior to, the previous calendar year.

(b) A new community water system must deliver to all its customers its first report by July 1 of the year after its first full calendar year in operation and annually thereafter.

(c) A community water system that sells water to another community water system must deliver the applicable information required in 40 CFR, Subpart O § 141.153 to the buyer system:

1. No later than April 19, 1999, by April 1, 2000, and by April 1 annually thereafter or

2. On a date mutually agreed upon by the seller and the purchaser, and specifically included in a contract between the parties.

3. Content of the reports: 40 CFR, Subpart O § 141.153 is hereby incorporated by reference.

4. Required additional health information: 40 CFR, Subpart O § 141.154 is hereby incorporated by reference.

5. Report delivery and recordkeeping: 40 CFR, Subpart O § 141.155 is hereby incorporated by reference.

6. Appendix A to Subpart O of 40 CFR 141 — Regulated Contaminants is hereby incorporated by reference.

7. Regulated Contaminants: Appendix B to 40 CFR, Subpart O is hereby incorporated by reference.

8. Health Effects Language: Appendix C to 40 CFR, subpart O is hereby incorporated by reference.

(3) **Electronic Delivery.**

(a) Community water systems may provide Consumer Confidence Reports electronically provided that:

1. The manner of the electronic delivery is a direct communication link, without use of an intermediary service;

2. There is an explanatory notice that accompanies the direct communication link;

3. The entire content of the Consumer Confidence Report is accessible;

4. The community water system shall provide the Consumer Confidence Report through another method should the community water system become aware of a customer's inability to receive the Consumer Confidence Report by the chosen electronic delivery method.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Public Hearings on Proposed Variances, Exemptions, and/or Schedules" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by Rule 391-3-5-.47. **Repealed:** F. May 12, 1989; eff. June 1, 1989. **Amended:** New Rule entitled "Consumer Confidence Reports" adopted. F. Sept. 24, 1999; eff. Oct. 14, 1999. **Amended:** F. June 8, 2001; eff. June 28, 2001. **Amended:** F. Dec. 10, 2002; eff. Dec. 30, 2002. **Amended:** New title "Consumer Confidence Reports. Amended." F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.42 Source Water Assessment. Amended.

(1) **Purpose.** The following Rule for Source Water Assessment serves to help protect the source waters of public water systems of the State.

(2) Requirement to Develop a Source Water Assessment Plan. By May 2003, each public water system of the State shall develop a Source Water Assessment Plan (SWAP) for every well and surface water intake used by the water system. SWAPs will be developed in accordance with the Division's Source Water Assessment and Protection Implementation Plan for Public Drinking Water Sources. Large surface water systems, which supply water (directly or through wholesale) to a population of 50,000 or more, will be delegated the responsibility of developing and implementing a Source Water Assessment Plan. Surface water systems which supply water (directly or through wholesale) to a population less than 50,000 will have the assessment done by the Division. The Division encourages both large and small surface water systems to create partnerships with each other and the Division in order to conduct assessment of common regional watersheds.

(3) **Components of a Source Water Assessment Plan.** A SWAP shall consist of four parts:

(a) The delineation of the area in proximity to the water well(s) or surface water intake(s) shall consist of:

1. At a minimum, a zone equivalent to the outer management zone of a wellhead protection area for water wells.

2. At a minimum, the upstream surface drinking water intake catchment area portions of the watershed as defined in the SWAP Implementation Plan.

(b) The water system shall inventory the potential pollution sources of natural and man-made origin within the area delineated in (a) above. The inventory will include the potential pollution sources as defined in the SWAP Implementation Plan.

(c) The water system shall carry out an assessment of the potential pollution sources' impact within the areas described by (a) above, on the raw water that may reach the water well(s) or surface water intake(s). Assessments for surface water intakes are to follow the guidance published in the SWAP Implementation Plan.

(d) The water system shall prepare a comprehensive SWAP report describing items (a), (b) and (c) above and submit the report to the Division for review and approval. The water system will make this report available to the public.

(4) **Use of Wellhead Protection Plans.** Public groundwater systems may use their prepared Wellhead Protection Plans and Vulnerability Assessments to satisfy the Source Water Assessment requirements.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Final Action on Variance/Exemption Request" adopted. F. July 5, 1977; eff. July 26, 1977, as specified by R. 391-3-5-.47. **Repealed:** F. May 12, 1989; eff. June 1, 1989. **Amended:** New Rule entitled "Source Water Assessment" adopted. F. Sept. 29, 2000; eff. Oct. 19, 2000. **Amended:** New title "Source Water Assessment. Amended." F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.43 Repealed.

Authority Ga. L. 1977, p. 351, et seq. History. Original Rule was filed on July 5, 1977; effective July 26, 1977, as specified by Rule 391-3-5-.47. Repealed: Rule renumbered as 391-3-5-.34. F. May 12, 1989; eff. Jun. 1, 1989.

391-3-5-.44 Repealed.

Authority Ga. L. 1977, p. 351. et seq. History. Original Rule was filed on July 5, 1977; effective July 26, 1977, as specified by Rule 391-3-5-.47. Repealed: Rule renumbered as 391-3-5-.35. F. May 12, 1989; eff. Jun. 1, 1989.

391-3-5-.45 Repealed.

Authority Ga. L. 1977, p. 351, et seq. **History.** Original Rule was filed on July 5, 1977; effective July 26, 1977, as specified by Rule 391-3-5-.47. **Repealed:** Rule renumbered as 391-3-5-.36. F. May 12, 1989; eff. Jun. 1, 1989.

391-3-5-.46 Repealed.

Authority Ga. L. 1977, p. 351. et seq. **History.** Original rule entitled "State Primacy Maintenance" was filed on July 5, 1977; effective July 26, 1977, as specified by Rule 391-3-5-.47. **Repealed:** Rule renumbered as 391-3-5-.37. F. May 12, 1989; eff. Jun. 1, 1989.

391-3-5-.47 Repealed.

Authority Ga. L. 1977, p. 351, et seq. **History.** Original Rule entitled "Effective Date" was filed on July 5, 1977; effective July 26, 1977, as specified by this Rule. **Repealed:** Rule renumbered as 391-3-5-.38. F. May 12, 1989; eff. Jun. 1, 1989.

391-3-5-.48 Repealed.

Authority Ga. L. 1977, p. 351, et seq. (Ga. Code Ann. Ch. 17-1301 et seq.); Ga. L. 1972, p. 1015, et seq., as amended (Ga. Code Ann. Sec. 40-3501 et seq.); Ga. L. 1980, Act #721 Approved March 5, 1980. **History.** Original Rule entitled "Public Water System Classification" was filed on June 24, 1980; effective July 14, 1980. **Repealed:** Rule renumbered as 391-3-5-.39. F. May 12, 1989; eff. Jun. 1, 1989.

391-3-5-.49 Repealed.

Authority Ga. L. 1977, p. 351, et seq. **History.** Original Rule entitled "Monitoring of Consecutive Public Water System" was filed on July 15, 1983; effective August 4, 1983; **Repealed:** Rule renumbered as 391-3-5-.31. F. May 12, 1989; eff. Jun. 1, 1989.

391-3-5-.50 Repealed.

Authority Ga. L. 1977, p. 351, et seq. **History.** Original Rule entitled "Trihalomethanes" was filed on July 15, 1983; effective August 4, 1983; **Repealed:** Rule renumbered as 391-5-.24. F. May 12, 1989; eff. Jun. 1, 1989.

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391-3-5-.51 Repealed.

Authority Ga. L. 1977, p. 351, et seq. **History.** Original rule entitled "Sodium and Corrosivity" was filed on July 15, 1983; effective August 4, 1983; **Repealed:** F. May 12, 1989; eff. Jun. 1, 1989.

391-3-5-.52 Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR).

(1) **Purpose.** The purpose of the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) is to reduce illness linked with the contaminant *Cryptosporidium* and other disease-causing microorganisms in drinking water. The rule supplements existing regulations by targeting additional *Cryptosporidium* treatment requirements to higher risk systems. This rule also contains provisions to reduce risks from uncovered finished water reservoirs and to ensure that systems maintain microbial protection when they take steps to decrease the formation of disinfection byproducts that result from chemical water treatment.

(2) **Applicability.** This regulation applies to all public water systems that use surface water or ground water under the direct influence (GWUDI) of surface water.

(3) Enhanced Treatment for *Cryptosporidium* – Subpart W.

(a) General requirements. The requirements of this Subpart W are national primary drinking water regulations. The regulations in this subpart establish or extend treatment technique requirements in lieu of maximum contaminant levels for *Cryptosporidium*. These requirements are in addition to requirements for filtration and disinfection in subparts H, P, and T of this part.

(b) Applicability. The requirements of this subpart apply to all subpart H systems, which are public water systems supplied by a surface water source and public water systems supplied by a ground water source under the direct influence of surface water.

1. Wholesale systems, as defined in 40 CFR § 141.2, must comply with the requirements of this subpart based on the population of the largest system in the combined distribution system.

2. The requirements of this subpart for filtered systems apply to systems required by National Primary Drinking Water Regulations

to provide filtration treatment, whether or not the system is currently operating a filtration system.

3. The requirements of this subpart for unfiltered systems apply only to unfiltered systems that timely met and continue to meet the filtration avoidance criteria in subparts H, P, and T of this part, as applicable.

(c) Requirements. Systems subject to this subpart must comply with the following requirements:

1. Systems must conduct an initial and a second round of source water monitoring for each plant that treats a surface water or GWUDI source. This monitoring may include sampling for *Cryptosporidium, E. coli,* and turbidity as described in 40 CFR §§ 141.701 through 141.706, to determine what level, if any, of additional *Cryptosporidium* treatment they must provide.

2. Systems that plan to make a significant change to their disinfection practice must develop disinfection profiles and calculate disinfection benchmarks, as described in 40 CFR §§ 141.708 through 141.709.

3. Filtered systems must determine their *Cryptosporidium* treatment bin classification as described in 40 CFR § 141.710 and provide additional treatment for *Cryptosporidium*, if required, as described in 40 CFR § 141.711. All unfiltered systems must provide treatment for *Cryptosporidium* as described in 40 CFR § 141.712. Filtered and unfiltered systems must implement *Cryptosporidium* treatment according to the schedule in 40 CFR § 141.713.

4. Systems with uncovered finished water storage facilities must comply with the requirements to cover the facility or treat the discharge from the facility as described in 40 CFR § 141.714.

5. Systems required to provide additional treatment for *Cryptosporidium* must implement microbial toolbox options that are designed and operated as described in 40 CFR §§ 141.715 through 141.720.

6. Systems must comply with the applicable recordkeeping and reporting requirements described in 40 CFR §§ 141.721 through 141.722.

7. Systems must address significant deficiencies identified in sanitary surveys performed by EPA or Division as described in 40 CFR § 141.723.

(4) **Source Water Monitoring.** 40 CFR, Subpart W § 141.701(a) through (h), in its entirety, is hereby incorporated by reference. Systems are required to conduct source water monitoring for *Cryptosporidium, E. coli,* and turbidity in accordance with the monitoring schedule specified in this section.

(5) **Sampling Schedules.** 40 CFR, Subpart W § 141.702(a) through (c), in its entirety, is hereby incorporated by reference. Systems required to conduct source water monitoring under 40 CFR § 141.701 must submit a sampling schedule that specifies the calendar dates when the system will collect each required sample.

(6) **Sampling Locations.** 40 CFR, Subpart W § 141.703(a) through (f), in its entirety, is hereby incorporated by reference. Systems required to conduct source water monitoring under 40 CFR § 141.701 must collect samples for each plant that treats a surface water or GWUDI source. Where multiple plants draw water from the same influent, such as the same pipe or intake, the Division may approve one set of monitoring results to be used to satisfy the requirements of 40 CFR § 141.701 for all plants. Systems must collect source water samples prior to chemical treatment, such as coagulants, oxidants and disinfectants, unless the Division determines that collecting a sample prior to chemical treatment is not feasible for the system and that the chemical treatment is unlikely to have a significant adverse effect on the analysis of the sample.

(7) **Analytical Methods.** 40 CFR, Subpart W § 141.704(a) through (c), in its entirety, is hereby incorporated by reference.

(8) Approved Laboratories. 40 CFR, Subpart W § 141.705(a)

through (c), in its entirety, is hereby incorporated by reference.

(9) **Reporting Source Water Monitoring Results.** 40 CFR, Subpart W § 141.706(a) through (e), in its entirety, is hereby incorporated by reference.

(10) **Grandfathering Previously Collected Data.** 40 CFR, Subpart W § 141.707(a) through (h), in its entirety, is hereby incorporated by reference. Systems may comply with the initial source water monitoring requirements of 40 CFR § 141.701(a) by grandfathering sample results collected before the system is required to begin monitoring (i.e., previously collected data). To be grandfathered, the sample results and analysis must meet the criteria in this section and the Division must approve.

(11) **Requirements when Making a Significant Change in Disinfection Practice.** 40 CFR, Subpart W § 141.708(a) through (b), in its entirety, is hereby incorporated by reference. Following the completion of initial source water monitoring under 40 CFR § 141.701(a), a system that plans to make a significant change to its disinfection practice, as defined in this section, must calculate disinfection benchmarks for *Giardia lamblia* and viruses as described in 40 CFR § 141.709. Prior to changing the disinfection practice, the system must notify the Division and must include in this notice the information outlined in this section. Significant changes to disinfection practice are defined as follows:

- (a) Changes to the point of disinfection;
- (b) Changes to the disinfectant(s) used in the treatment plant;
- (c) Changes to the disinfection process; or

(d) Any other modification identified by the State as a significant change to disinfection practice.

(12) **Developing the Disinfection Profile and Benchmark.** 40 CFR, Subpart W § 141.709(a) through (e), in its entirety, is hereby incorporated by reference. Systems required to develop disinfection profiles under 40 CFR § 141.708 must follow the requirements of this section. Systems must monitor at least

weekly for a period of 12 consecutive months to determine the total log inactivation for *Giardia lamblia* and viruses. The disinfection benchmark is the lowest monthly mean value (for systems with one year of profiling data) or the mean of the lowest monthly mean values (for systems with more than one year of profiling data) of *Giardia lamblia* and virus log inactivation in each year of profiling data.

(13) **Bin Classification for Filtered Systems.** 40 CFR, Subpart W § 141.710(a) through (f), in its entirety, is hereby incorporated by reference. Following completion of the initial round of source water monitoring required under 40 CFR § 141.701(a), filtered systems must calculate an initial *Cryptosporidium* bin concentration for each plant for which monitoring was required. Calculation of the bin concentration must use the *Cryptosporidium* results reported under 40 CFR § 141.701(a) and must follow the procedures outlined in this section.

(a) Filtered systems must determine their initial bin classification from the table in 40 CFR 141.710(c) and using the *Cryptosporidium* bin concentration calculated under paragraphs (a)–(b) of this section (40 CFR, Subpart W § 141.710).

(b) Following completion of the second round of source water monitoring required under 40 CFR § 141.701(b), filtered systems must recalculate their *Cryptosporidium* bin concentration using the *Cryptosporidium* results reported under 40 CFR § 141.701(b) and following the procedures in paragraphs (b)(1) through (4) of 40 CFR § 141.710. Systems must then redetermine their bin classification using this bin concentration and the table in paragraph (c) of 40 CFR § 141.710.

(14) **Filtered System Additional** *Cryptosporidium* **Treatment Requirements.** 40 CFR, Subpart W § 141.711(a) through (d), in its entirety, is hereby incorporated by reference. Filtered systems must provide the level of additional treatment for *Cryptosporidium* specified in paragraph (a) of 40 CFR § 141.711 based on their bin classification as determined under 40 CFR § 141.710 and according

to the schedule in 40 CFR § 141.713.

(a) Filtered systems must use one or more of the treatment and management options listed in 40 CFR § 141.715, termed the microbial toolbox, to comply with the additional *Cryptosporidium* treatment required in paragraph (a) of 40 CFR § 141.711.

(b) Systems classified in Bin 3 and Bin 4 must achieve at least 1log of the additional *Cryptosporidium* treatment required under paragraph (a) of 40 CFR § 141.711 using either one or a combination of the following: bag filters, bank filtration, cartridge filters, chlorine dioxide, membranes, ozone, or UV, as described in 40 CFR §§ 141.716 through 141.720.

(c) Failure by a system in any month to achieve treatment credit by meeting criteria in §§ 141.716 through 141.720 for microbial toolbox options that is at least equal to the level of treatment required in paragraph (a) of 40 CFR § 141.711 is a violation of the treatment technique requirement.

(15) Unfiltered System *Cryptosporidium* Treatment Requirements. All systems that are using surface water sources or groundwater sources that are determined to be under the direct influence of surface water supplies are required to provide filtration and disinfection treatments, in addition to that other treatments that are required by the Division, in order to comply with the drinking water standards, regulations and operating permit conditions, required by the Rules for Safe Drinking Water, Chapter 391-3-5. In order to provide regulatory information on the *Cryptosporidium* treatment requirements for unfiltered water systems, 40 CFR, Subpart W § 141.712(a) through (d) is hereby incorporated by reference.

(16) Schedule for Compliance with *Cryptosporidium* Treatment Requirements.

(a) Following initial bin classification under 40 CFR § 141.710(c), filtered systems must provide the level of treatment for *Cryptosporidium* required under 40 CFR § 141.711 according to

the schedule in paragraph (c) of this section.

(b) Following initial determination of the mean *Cryptosporidium* level under 40 CFR § 141.712(a)(1), unfiltered systems must provide the level of treatment for *Cryptosporidium* required under 40 CFR § 141.712 according to the schedule in paragraph (c) of this section.

(c) Cryptosporidium treatment compliance dates.

CRYPTOSPORIDIUM TREATMENT COMPLIANCE DATES TABLE				
Systems that serve	Must comply with Cryptosporidium treatment requirements no later than ⁽¹⁾			
At least 100,000 people.	April 1, 2012			
From 50,000 to 99,999 people.	October 1, 2012			
From 10,000 to 49,999 people.	October 1, 2013			
Fewer than 10,000 people.	October 1, 2014			
Note: ⁽¹⁾ States may allow up to an additional two years for complying with the treatment requirement for systems making capital improvements.				

(d) If the bin classification for a filtered system changes following the second round of source water monitoring, as determined under 40 CFR § 141.710(d), the system must provide the level of treatment for *Cryptosporidium* required under 40 CFR § 141.711 on a schedule the Division approves.

(e) If the mean *Cryptosporidium* level for an unfiltered system changes following the second round of monitoring, as determined under 40 CFR § 141.712(a)(2), and if the system must provide a different level of *Cryptosporidium* treatment under 40 CFR § 141.712 due to this change, the system must meet this treatment requirement on a schedule the Division approves.

(17) **Requirements for Uncovered Finished Water Storage Facilities.** All finished water storage facilities must be provided with a permanent cover, in accordance with Section 391-3-5-.11 of the rules. In order to provide regulatory information on the requirements for uncovered finished water storage facilities, 40 CFR, Subpart W § 141.714(a) through (d) is hereby incorporated by reference. Microbial toolbox options for meeting *Cryptosporidium* treatment requirements. 40 CFR, Subpart W § 141.715(a) through (b) is hereby incorporated by reference.

(a) Source toolbox components. 40 CFR, Subpart W § 141.716(a) through (b) is hereby incorporated by reference.

(b) Pre-filtration treatment toolbox components. 40 CFR, Subpart W § 141.717(a) through (c) is hereby incorporated by reference.

(c) Treatment performance toolbox components. 40 CFR, SubpartW § 141.718(a) through (c) is hereby incorporated by reference.

(d) Additional filtration toolbox components. 40 CFR, Subpart W § 141.719(a) through (d) is hereby incorporated by reference.

(e) Inactivation toolbox components. 40 CFR, Subpart W § 141.720(a) through (d) is hereby incorporated by reference.

(18) **Reporting Requirements.** 40 CFR, Subpart W § 141.721(a) through (f) is hereby incorporated by reference.

(19) **Recordkeeping Requirements.** 40 CFR, Subpart W § 141.722(a) through (c) is hereby incorporated by reference.

(20) Requirements to Respond to Significant Deficiencies Identified in Sanitary Surveys Performed by EPA or Division. 40 CFR, Subpart W § 141.723(a) through (d) is hereby incorporated by reference. Systems must respond in writing to significant deficiencies identified in sanitary survey reports no later than forty-five (45) days after receipt of the report, indicating how and on what schedule the system will address significant deficiencies identified in sanitary survey reports according to the approved schedule, or if there is no approved schedule, according to the schedule submitted by the system if such deficiencies are within the control of the system.

(21) **Division Recordkeeping.** The records kept by the Division shall be in accordance with 40 CFR § 142.14.

(22) **Division Reporting.** The reporting by the Division shall be performed as required by 40 CFR § 142.15.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)" adopted. F. May 27, 2009; eff. June 16, 2009. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.53 Stage 2 Disinfection Byproducts Rule (Stage 2 DBPR)

Purpose. The Stage 2 Disinfection Byproducts Rule (DBPR) (40 CFR, Subpart V § 141) builds on existing regulations by requiring water systems to meet disinfection byproduct (DBP) maximum contaminant levels (MCLs) at each monitoring site in the distribution system to better protect public health. The Stage 2 DBPR includes a provision requiring all community water systems (CWS) and only non-transient non-community water systems (NTNCWS) serving more than 10,000 people to conduct an initial distribution system evaluation (IDSE) (40 CFR, Subpart U § 141). NTNCWS serving less than 10,000 are exempted from IDSE requirements, but will need to comply with the Stage 2 DBPR compliance monitoring requirements. The goal of the IDSE is to characterize the distribution system and identify monitoring sites where customers may be exposed to high levels of total trihalomethanes (TTHM) and haloacetic acids (HAA5).

(1) Initial Distribution System Evaluations – Subpart U.

(a) General requirements. The requirements of Subpart U of this part 141 constitute national primary drinking water regulations. The regulations in this Subpart establish monitoring and other requirements for identifying Subpart V compliance monitoring locations for determining compliance with maximum contaminant levels for total trihalomethanes (TTHM) and haloacetic acids (five) (HAA5). You must use an Initial Distribution System Evaluation (IDSE) to determine locations with representative high TTHM and HAA5 concentrations throughout your distribution system. IDSEs are used in conjunction with, but separate from, Subpart L compliance monitoring, to identify and select Subpart V compliance monitoring locations.

(b) Applicability. Public water systems are subject to these requirements if the water system is a community water system that uses a primary or residual disinfectant other than ultraviolet light or delivers water that has been treated with a primary or residual disinfectant other than ultraviolet light; or if the water system is a non-transient non-community water system that serves at least 10,000 people and uses a primary or residual disinfectant other than ultraviolet light or delivers water that has been treated with a primary or residual disinfectant other than ultraviolet light.

(c) Schedule. 40 CFR Subpart U § 141.600(c), in its entirety, is hereby incorporated by reference. Systems required to comply with Initial Distribution System Evaluations – Subpart U, must comply with the schedule specified in the table 40 CFR § 141.600(c)(1). A wholesale system or a consecutive system must comply with the specified schedule at the same time as the system with the earliest compliance date in the combined distribution system.

(d) 40 CFR Subpart U § 141.600(d) through (f), in its entirety, is hereby incorporated by reference.

(e) Standard Monitoring. 40 CFR Subpart U § 141.601 is hereby incorporated by reference.

1. Standard monitoring plan. 40 CFR Subpart U § 141.601(a) through (c), in its entirety, is hereby incorporated by reference.

2. System specific studies. 40 CFR Subpart U § 141.602(a) through (b), in its entirety, is hereby incorporated by reference.

3. 40/30 Certification. 40 CFR Subpart U § 141.603(a) through (b), in its entirety, is hereby incorporated by reference.

4. Very small system waivers. 40 CFR Subpart U § 141.604(a) through (b), in its entirety, is hereby incorporated by reference.

(f) Subpart V compliance monitoring location recommendations. 40 CFR Subpart U § 141.605(a) through (e), in its entirety, is hereby incorporated by reference. Water system's IDSE report must include the recommendations and justification for where and during what month(s) TTHM and HAA5 monitoring for Subpart V of part 141 should be conducted. Water system must base its recommendations on the criteria in paragraphs (b) through (e) of this section.

(2) Stage 2 Disinfection Byproducts Requirements– Subpart V.

(a) General requirements. The requirements of Subpart V of this part constitute national primary drinking water regulations. The regulations in this Subpart establish monitoring and other requirements for achieving compliance with maximum contaminant levels based on locational running annual averages (LRAA) for total trihalomethanes (TTHM) and haloacetic acids (five) (HAA5), and for achieving compliance with maximum residual disinfectant residuals for chlorine and chloramine for certain consecutive systems.

(b) Applicability. Public water systems are subject to these requirements if the system is a community water system or a nontransient non-community water system that uses a primary or residual disinfectant other than ultraviolet light or delivers water that has been treated with a primary or residual disinfectant other than ultraviolet light.

(c) Schedule. 40 CFR Subpart V § 141.620(c), in its entirety, is hereby incorporated by reference. Systems required to comply with Stage 2 Disinfection Byproducts Requirements – Subpart V, must comply with the schedule specified in the table 40 CFR § 141.620(c). A wholesale system or a consecutive system must comply with the specified schedule at the same time as the system with the earliest compliance date in the combined distribution system.

- 1. Systems serving 100,000 or more people: April 1, 2012
- 2. Systems serving 50,000-99,999 people: October 1, 2012
- 3. Systems serving 10,000-49,999 people: October 1, 2013

4. Systems serving fewer than 10,000 people: October 1, 2013 if no *Cryptosporidium* monitoring is required under 40 CFR § 141.701(a)(4) OR October 1, 2014 if *Cryptosporidium* monitoring is required under 40 CFR § 141.701(a)(4) or (a)(6).

(d) Monitoring frequency must be in accordance with 40 CFR

Subpart V § 141.621(a)(2).

1. If a water system is required to conduct quarterly monitoring, it must begin monitoring in the first full calendar quarter that includes the compliance date in the table in paragraph 40 CFR § 141.620(c).

2. If a water system is required to conduct monitoring at a frequency that is less than quarterly, it must begin monitoring in the calendar month recommended in the IDSE report prepared under 40 CFR § 141.601 or 40 CFR § 141.602 or the calendar month identified in the Subpart V monitoring plan developed under 40 CFR § 141.622 no later than twelve (12) months after the compliance date in paragraph 40 CFR § 141.620(c).

3. If a water system is required to conduct quarterly monitoring, it must make compliance calculations at the end of the fourth calendar quarter that follows the compliance date and at the end of each subsequent quarter (or earlier if the LRAA calculated based on fewer than four quarters of data would cause the MCL to be exceeded regardless of the monitoring results of subsequent quarters). If a water system is required to conduct monitoring at a frequency that is less than quarterly, it must make compliance calculations beginning with the first compliance sample taken after the compliance date.

4. For the purpose of the schedule in paragraph 40 CFR § 141.620(c), the Division may determine that the combined distribution system does not include certain consecutive systems based on factors such as receiving water from a wholesale system only on an emergency basis or receiving only a small percentage and small volume of water from a wholesale system. The Division may also determine that the combined distribution system does not include certain wholesale systems based on factors such as delivering water to a consecutive system only on an emergency basis or delivering only a small percentage and small volume of water to a consecutive system.

(e) Monitoring and compliance.

1. Systems required to monitor quarterly. To comply with Subpart V MCLs in 40 CFR § 141.64(b)(2), water system must calculate LRAAs for TTHM and HAA5 using monitoring results collected under this Subpart and determine that each LRAA does not exceed the MCL. If water system fails to complete four consecutive quarters of monitoring, you must calculate compliance with the MCL based on the average of the available data from the most recent four quarters. If you take more than one sample per quarter at a monitoring location, you must average all samples taken in the quarter at that location to determine a quarterly average to be used in the LRAA calculation.

2. Systems required to monitor yearly or less frequently. To determine compliance with Subpart V MCLs in 40 CFR § 141.64(b)(2), water system must determine that each sample taken is less than the MCL. If any sample exceeds the MCL, it must comply with the requirements of 40 CFR § 141.625. If no sample exceeds the MCL, the sample result for each monitoring location is considered the LRAA for that monitoring location.

(f) Violations. Water system is in violation of the monitoring requirements for each quarter that a monitoring result would be used in calculating an LRAA if it fails to monitor.

(g) Routine monitoring. If a water system submitted an IDSE report, it must begin monitoring at the locations and months it has recommended in its IDSE report submitted under 40 CFR § 141.605 following the schedule in 40 CFR § 141.620(c), unless the Division requires other locations or additional locations after its review. If a water system submitted a 40/30 certification under 40 CFR § 141.603 or it qualified for a very small system waiver under 40 CFR § 141.604 or it is a non-transient non-community water system serving less than 10,000, it must monitor at the location(s) and dates identified in its monitoring plan in 40 CFR § 141.132(f), updated as required by 40 CFR § 141.622.

(h) Water system must monitor at no fewer than the number of locations identified in this paragraph:

Source Water Type	Population Served	Monitoring Frequency ⁽¹⁾	Distribution System Monitoring Locations Total per Monitoring Period ⁽²⁾
Subpart	Fewer than 500	per year	2
Н	500-3,300	per quarter	2
	3,301-9,999	per quarter	2
	10,000-49,999	per quarter	4
	50,000-249,999	per quarter	8
	250,000-999,999	per quarter	12
	1,00,000-4,999,999	per quarter	16
	5,000, 000 or more	per quarter	20
Ground	Fewer than 500	per year	2
Water	500-9,999	per year	2
	10,000-99,999	per quarter	4
	100,000-499,999	per quarter	6
	500,000 or more	per quarter	8

NOTES:

(1) All systems must monitor during the highest month of DBP concentrations.

(2) Systems on quarterly monitoring must take dual sample sets every 90 days at each monitoring location, except for Subpart H systems serving 500–3,300 persons. Systems on annual monitoring and Subpart H systems serving 500–3,300 persons are required to take individual TTHM and HAA5 samples (instead of a dual sample set) at the locations with the highest TTHM and HAA5 concentrations, respectively. Only one location with a dual sample set per monitoring period is needed if highest TTHM and HAA5 concentrations occur at the same location (and month, if monitored annually).

(i) If a water system is an undisinfected system that begins using a disinfectant other than UV light after the dates in Subpart U of this part for complying with the Initial Distribution System Evaluation requirements, it must consult with the Division to identify compliance monitoring locations for this Subpart. The water system must then develop a monitoring plan under 40 CFR § 141.622 that includes those monitoring locations.

(j) Analytical methods. The water system must use an approved method listed in 40 CFR § 141.131, as stated in Section 391-3-5-.24(4)(g) of the Rules, for TTHM and HAA5 analyses. Analyses must be conducted by laboratories that have received certification by EPA or the Division.

(3) Monitoring Plans for Stage 2 Disinfection Byproducts Requirements–Subpart V.

(a) Water system must develop and implement a monitoring plan to be kept on file for Division and public review. The monitoring plan must contain the following elements and be complete no later than the date it conducts its initial monitoring under this Subpart.

- 1. Monitoring locations;
- 2. Monitoring dates;
- 3. Compliance calculation procedures; and

4. Monitoring plans for any other systems in the combined distribution system if the Division has reduced monitoring requirements under its authority.

(b) If a water system was not required to submit an IDSE report under either 40 CFR § 141.601 or § 141.602, and it does not have sufficient Subpart L (Stage 1 DBPR) monitoring locations to identify the required number of Subpart V (Stage 2 DBPR) compliance monitoring locations indicated in 40 CFR § 141.605(b), it must identify additional locations by alternating selection of locations representing high TTHM levels and high HAA5 levels until the required number of compliance monitoring locations have been identified. It must also provide the rationale for identifying the locations as having high levels of TTHM or HAA5. If it has more Subpart L monitoring locations than required for Subpart V compliance monitoring in 40 CFR § 141.605(b), it must identify which locations it will use for Subpart V compliance monitoring by alternating selection of locations representing high TTHM levels and high HAA5 levels until the required number of Subpart V compliance monitoring locations have been identified.

(c) A Subpart H water system serving over 3,300 people must submit a copy of its monitoring plan to the Division prior to the date it conducts its initial monitoring under this Subpart, unless its IDSE report submitted under Subpart U of this part contains all the information required by this section.

(d) A water system may revise its monitoring plan to reflect changes in treatment, distribution system operations and layout (including new service areas), or other factors that may affect TTHM or HAA5 formation, or for Division-approved reasons, after consultation with the Division regarding the need for changes and the appropriateness of changes. If a water system changes monitoring locations, it must replace existing compliance monitoring locations with the lowest LRAA with new locations that reflect the current distribution system locations with expected high TTHM or HAA5 levels. The Division may also require modifications in water system's monitoring plan. A Subpart H system serving over 3,300 people must submit a copy of its modified monitoring plan to the Division prior to the date it is required to comply with the revised monitoring plan.

(4) **Reduced Monitoring.**

(a) The water system may reduce monitoring to the level specified in table 40 CFR § 141.623(a) any time the LRAA is less than or equal to (\leq) 0.040 mg/L for TTHM and less than or equal to (\leq) 0.030 mg/L for HAA5 at all monitoring locations. It may only use

data collected under the provisions of this Subpart or Subpart L of this part to qualify for reduced monitoring. In addition, the source water annual average TOC level, before any treatment, must be less than or equal to (\leq) 4.0 mg/L at each treatment plant treating surface water or ground water under the direct influence of surface water, based on monitoring conducted under either 40 CFR §141.132(b)(1)(iii) or §141.132(d).

(b) The water system may remain on reduced monitoring as long as the TTHM LRAA less than or equal to (\leq) 0.040 mg/L and the HAA5 LRAA less than or equal to (\leq) 0.030 mg/L at each monitoring location (for systems with quarterly reduced monitoring) or each TTHM sample less than or equal to (\leq) 0.060 mg/L and each HAA5 sample less than or equal to (\leq) 0.045 mg/L (for systems with annual or less frequent monitoring). In addition, the source water annual average TOC level, before any treatment, must be less than or equal to (\leq) 4.0 mg/L at each treatment plant treating surface water or ground water under the direct influence of surface water, based on monitoring conducted under either 40 CFR § 141.132(b)(1)(iii) or §141.132(d).

(c) If the LRAA based on quarterly monitoring at any monitoring location exceeds either 0.040 mg/L for TTHM or 0.030 mg/L for HAA5 or if the annual (or less frequent) sample at any location exceeds either 0.060 mg/L for TTHM or 0.045 mg/L for HAA5, or if the source water annual average TOC level, before any treatment, is greater than (>) 4.0 mg/L at any treatment plant treating surface water or ground water under the direct influence of surface water, the water system must resume routine monitoring under 40 CFR § 141.621 or begin increased monitoring if 40 CFR § 141.625 applies.

(d) The Division may return the water system to routine monitoring at its discretion.

(5) Additional Requirements for Consecutive Systems. A consecutive system that does not add a disinfectant but delivers water that has been treated with a primary or residual disinfectant

other than ultraviolet light must comply with analytical and monitoring requirements for chlorine and chloramines in 40 CFR § 141.131 (c) and § 141.132(c)(1) and the compliance requirements in 40 CFR § 141.133(c)(1) beginning April 1, 2009, unless required earlier by the Division, and report monitoring results under 40 CFR § 141.134(c).

(6) Conditions Requiring Increased Monitoring.

(a) A water system that is required to monitor at a particular location annually or less frequently than annually under 40 CFR § 141.621 or § 141.623 must increase monitoring to dual sample sets once per quarter (taken every 90 days) at all locations if a TTHM sample is >0.080 mg/L or a HAA5 sample is >0.060 mg/L at any location.

(b) A water system is in violation of the MCL when the LRAA exceeds the Subpart V MCLs in 40 CFR § 141.64(b)(2), calculated based on four consecutive quarters of monitoring (or the LRAA calculated based on fewer than four quarters of data if the MCL would be exceeded regardless of the monitoring results of subsequent quarters). The water system is in violation of the monitoring requirements for each quarter that a monitoring result would be used in calculating an LRAA if it fails to monitor.

(c) A water system may return to routine monitoring once it has conducted increased monitoring for at least four consecutive quarters and the LRAA for every monitoring location is ≤ 0.060 mg/L for TTHM and ≤ 0.045 mg/L for HAA5.

(7) **Operational Evaluation Levels.**

(a) The water system has exceeded the operational evaluation level at any monitoring location where the sum of the two previous quarters' TTHM results plus twice the current quarter's TTHM result, divided by 4 to determine an average, exceeds 0.080 mg/L, or where the sum of the two previous quarters' HAA5 results plus twice the current quarter's HAA5 result, divided by 4 to determine an average, exceeds 0.060 mg/L.

1. If a water system exceeds the operational evaluation level, it must conduct an operational evaluation and submit a written report of the evaluation to the Division no later than 90 days after being notified of the analytical result that causes it to exceed the operational evaluation level. The written report must be made available to the public upon request.

2. The operational evaluation must include an examination of system treatment and distribution operational practices, including storage tank operations, excess storage capacity, distribution system flushing, changes in sources or source water quality, and treatment changes or problems that may contribute to TTHM and HAA5 formation and what steps could be considered to minimize future exceedences.

(i) The water system may request and the Division may allow you to limit the scope of its evaluation if it is able to identify the cause of the operational evaluation level exceedance.

(ii) The water system's request to limit the scope of the evaluation does not extend the schedule in paragraph (b)1. of this section for submitting the written report. The Division must approve this limited scope of evaluation in writing and the water system must keep that approval with the completed report.

(8) **Requirements for Remaining on Reduced TTHM and HAA5 Monitoring Based on Subpart L Results.** 40 CFR Subpart V § 141.627 is hereby incorporated by reference.

(9) **Requirements for Remaining on Increased TTHM and HAA5 Monitoring Based on Subpart L Results.** 40 CFR Subpart V § 141.628 is hereby incorporated by reference.

(10) **Reporting and Recordkeeping Requirements.** 40 CFR Subpart V § 141.629 is hereby incorporated by reference.

(11) **Division Recordkeeping.** The records kept by the Division shall be in accordance with 40 CFR § 142.14.

Rules for Safe Drinking Water

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Stage 2 Disinfection Byproducts Rule (Stage 2 DBPR)" adopted. F. May 27, 2009; eff. June 16, 2009. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

391-3-5-.54 Ground Water Rule.

Purpose. The United States Environmental Protection Agency established the Ground Water Rule, which the Division has adopted, to provide increased protection against microbial pathogens in public water systems that use groundwater as the source of drinking water.

(1) **General Requirements and Applicability.** 40 CFR, Subpart S §141.400 is hereby incorporated by reference.

(a) This Rule applies to the following:

1. Systems relying totally on groundwater; purchased water systems or consecutive systems receiving groundwater;

2. Mixed surface and groundwater systems where untreated groundwater is added directly to the distribution system or to the treated surface water prior to entry into the distribution system.

(b) Hydrogeologic Sensitivity Assessments.

1. Hydrogeologically sensitive settings include Karst (carbonate rock, i.e. limestone and dolostone), fractured bedrock and gravel.

2. Drinking water produced by water systems from aquifers consisting of the above geologic materials require hydrogeologic sensitivity assessments prepared by the Division.

3. The information that the Division requires to prepare a hydrogeologic sensitivity assessment may be requested by the Division from the water source's owner and/or found in one or all of three regulatory reports approved by the EPA:

(i) A water source's Well Head Protection Plan,

(ii) The Source Water Assessment, and/or

(iii) The Individual Source Vulnerability Assessment.

4. A water source Well Head Protection Plan consists of the information outlined in Chapter Section 391-3-5-.40(3) through

(7).

5. A water source, Source Water Assessment consists of the information outlined in Chapter Sections 391-3-5-.06(4) and 391-3-5-.42(3) and (4).

6. A water source Individual Source Vulnerability Assessment consists of the information outlined in Chapter Sections 391-3-5-.22(g) through (i).

7. The water source rating developed for Individual Source Vulnerability Assessments is to be used to determine if a source is at high, medium, or low risk to microbiological contamination.

(c) Groundwater systems must comply with the requirements of this section beginning December 1, 2009.

(2) **Sanitary Surveys for Groundwater Systems.** 40 CFR, Subpart S § 141.401 is hereby incorporated by reference.

(a) Groundwater systems must provide the Division, at the Division's request, any existing information that will enable the Division to conduct a sanitary survey.

(b) A sanitary survey conducted by the Division includes an onsite review of the water source(s), facilities, equipment, operation, maintenance, and monitoring compliance of a public water system to evaluate the adequacy of the system, its sources and operations and the distribution of safe drinking water.

(c) The sanitary survey includes an evaluation of the applicable components listed below:

- 1. Source,
- 2. Treatment,
- 3. Distribution system,
- 4. Finished water storage,
- 5. Pumps, pump facilities, and controls,
- 6. Monitoring, reporting, and data verification,

7. System management and operation, and

8. Operator compliance with State requirements.

(3) **Groundwater Source Microbial Monitoring and Analytical Methods.** 40 CFR, Subpart S §141.402 is hereby incorporated by reference.

(a) Triggered source water monitoring is required when a groundwater system doesn't provide at least 4-log treatment of viruses before or at the first customer for each groundwater source in accordance with 40 CFR § 141.402(a).

1. A groundwater system must collect at least one 100 mL groundwater source sample from each source in use at the time of the total coliform-positive. This sample may be counted as a repeat sample or an additional sample collected along with the required number of repeat samples.

2. The source water sample must be analyzed for *E. coli* using a Division approved method. If found to be positive for *E. coli* the system must:

(i) Take corrective action as directed by the Division or

(ii) Collect 5 additional source water samples from that source within 24 hours to be analyzed for *E. coli*. The Division may extend the 24 hour time limit on a case-by-case basis.

(iii) If any of the additional source water samples are *E. coli* positive, then mandatory corrective action is required.

3. The Division does have the option to invalidate or waive triggered source water monitoring as stated in 40 CFR § 141.21(c) requirements when

(i) Total coliform positive sample is directly related to the distribution system.

(ii) Treatment problems.

(iii) Improperly constructed well.

(iv) System management and operation problems, etc.

4. Consecutive systems must notify the wholesale system within 24 hours of being notified of a total coliform positive sample. The wholesaler must collect a triggered source water sample within 24 hours from every one of its groundwater sources that may have supplied the consecutive system. If the sample is *E. coli* positive the wholesaler must notify any consecutive system served by the source(s) within 24 hours of being notified of the positive.

(b) Assessment Source Water Monitoring maybe required in accordance with 40 CFR § 141.402(b) by the Division for those systems that are at a higher risk for *E. coli* contamination based on source water assessment data, wellhead protection plans and historical monitoring data. They maybe require to perform one or more of the following based on a review by the Division on a case-by-case basis.

1. Collect a total of 12 groundwater source samples representing each month the system provides groundwater to the public.

2. Collect samples from each well unless the system obtains written approval from the Division to conduct monitoring at one or more wells within the system that are representative of multiple wells used by the system and that draw water from the same hydrogeological setting.

3. Collect groundwater source samples at a location prior to any treatment of the groundwater source unless the state approves a sampling location after treatment.

4. Collect groundwater samples at the well itself unless the system's configuration doesn't allow for such sampling and the Division approves an alternate sampling location that is representative of the water quality of the well.

(c) Positive Assessment Source Water samples will require the system to provide Tier 1 Public Notice, and the system must take corrective action as directed by the Division.

(d) Analytical Methods: 40 CFR § 141.402(c) see § 141-

Regulating Contaminants.

(4) **Treatment Technique Requirements for Groundwater Systems.** 40 CFR, Subpart S §141.403 is hereby incorporated by reference.

(a) The treatment technique requirements of this section must be met by groundwater systems with significant deficiencies or source water fecal contamination:

1. When a significant deficiency is identified or when a groundwater source sample collected under 40 CFR § 141.402(a)(3) is fecal positive.

2. When directed by the Division, if a groundwater system with a groundwater source sample collected under 40 CFR § 141.402(a)(2), § 141.402(a)(4), or § 141.402(b) is fecal positive.

3. When a significant deficiency is identified at a Subpart H public water system that uses both groundwater and surface water or groundwater under the direct influence of surface water, the system must comply with this section except in cases where the Division determines that the significant deficiency is in a portion of the distribution system that is served solely by surface water or groundwater under the direct influence of surface water.

4. Unless directed by the Division to implement a specific corrective action, the groundwater system must consult with the Division regarding the appropriate corrective action within thirty (30) days of receiving written notice from the Division of a significant deficiency, written notice from a laboratory that a groundwater source sample collected under 40 CFR § 141.402(a)(3) was found to be fecal positive, or direction from the Division that a fecal positive collected under 40 CFR § 141.402(a)(2), § 141.402(a)(4), or § 141.402(b) requires corrective action.

5. Within 120 days of receiving written notification from the Division of a significant deficiency, written notice from a laboratory that a groundwater source sample collected under 40

CFR § 141.402(a)(3) was found to be fecal positive, or direction from the Division that a fecal positive collected under 40 CFR § 141.402(a)(2), § 141.402(a)(4), or § 141.402(b) requires corrective action, the groundwater system must either:

(i) Have completed corrective action in accordance with a Division approved corrective action plan.

(ii) Be in compliance with a Division approved corrective action plan and schedule subject to the conditions specified in paragraphs (a) and (b) of this section.

(I) The Division must approve any modifications to the corrective action plan and schedule.

(II) The system must comply with any interim measures specified by the Division for the protection of the public health pending Division approval of the corrective action plan and schedule or pending completion of the corrective action.

6. Groundwater systems that meet the conditions of paragraph (a)1. or (a)2. of this section must implement one or more of the following corrective action alternatives:

- (i) Correct all significant deficiencies;
- (ii) Provide an alternate source of water;
- (iii) Eliminate the source of contamination; or

(iv) Provide treatment that reliably achieves at least 4-log treatment of viruses (using inactivation, removal, or a combination of both) before or at the first customer for the groundwater source.

7. Special Notice to the public of significant deficiencies or source water fecal contamination.

(i) In addition to the applicable public notification requirements of 40 CFR § 141.402, a community groundwater system that receives notice from the Division of a significant deficiency or notification of a fecal positive groundwater source sample that is not invalidated by the Division under 40 CFR § 141.402(d) must inform the public served by the water system under 40 CFR § 141.153(h)(6) of the fecal positive source sample or of any significant deficiency that has not been corrected. The system must continue to inform the public annually until the significant deficiency is corrected or the fecal contamination in the groundwater source is determined by the Division to be corrected under paragraph (a)5. of this section.

(ii) In addition to the applicable public notification requirements of 40 CFR § 141.402, a non-community groundwater system that receives notice from the Division of a significant deficiency must inform the public served by the water system in a manner approved by the Division of any significant deficiency that has not been corrected within twelve (12) months of being notified. The system must continue to inform the public annually until the significant deficiency is corrected. The information must include:

(I) The nature of the significant deficiency and the date the significant deficiency was identified by the Division;

(II) The Division approved plan and schedule for correction of the significant deficiency, including interim measures, progress to date, and any interim measures completed; and

(III) For systems with a large portion of non-English speaking consumers, as determined by the Division, information in the appropriate language regarding the importance of the notice or a telephone number or address where consumers may contact the system to obtain a translated copy of the notice or assistance in the appropriate language.

(iii) If directed by the Division, a non-community water system with significant deficiencies that have been corrected must inform its customers of the significant deficiencies, how the deficiencies were corrected, and the dates of correction.

(b) Compliance Monitoring.

1. 40 CFR, Subpart S, § 141.403(b), § 141.403(c), and § 141.403(d) are hereby incorporated by reference.

2. A groundwater system that is not required to meet the source water monitoring requirements in this section because it provides at least 4-log treatment of viruses for any groundwater source must notify the State in writing that it is providing at least 4-log treatment of viruses and begin compliance monitoring in accordance with this section by December 1, 2009.

3. A groundwater system that places a groundwater source in service after November 30, 2009, that is not required to meet the source water monitoring requirements in this section because it provides at least 4-log treatment of viruses for any groundwater source must notify the State in accordance with § 141.403(b)(2)(i), (b)(2)(ii) and (b)(2)(iii) and conduct compliance monitoring as required under § 141.403(b)(3) within thirty days of placing the source in service.

4. If the system subsequently discontinues 4-log treatment of viruses before or at the first customer for a groundwater source, the system must conduct groundwater source monitoring as required under 40 CFR § 141.402.

5. A groundwater system serving greater than 3,300 people that is required to conduct compliance monitoring must continuously monitor the residual disinfectant concentration using analytical methods specified in 40 CFR § 141.74(a)(2) at a location approved by the State and must record the lowest residual disinfectant concentration each day that water from the groundwater source is served to the public. The groundwater system must maintain the State-determined residual disinfectant concentration every day the groundwater system serves water from the groundwater source to the public. If there is a failure in the continuous monitoring equipment, the groundwater system must conduct grab sampling every four hours until the continuous monitoring equipment is returned to service. The system must resume continuous residual disinfectant monitoring within 14 days.

6. A groundwater system serving 3,300 or fewer people that is required to conduct compliance monitoring must monitor the

residual disinfectant concentration using analytical methods specified in 40 CFR § 141.74(a)(2) at a location approved by the State and record the residual disinfect concentration each day that water from the groundwater source is served to the public. The groundwater system must maintain the State-determined residual disinfectant concentration every day the groundwater system serves water from the groundwater source to the public. The groundwater system must take a daily grab sample during the hour of peak flow or at another time specified by the State. If any daily grab sample measurement falls below the State-determined residual disinfectant concentration, the groundwater system must take follow-up samples every four hours until the residual disinfectant concentration is restored to the State-determined level. Alternatively, a groundwater system that serves 3,300 or fewer people may monitor continuously and meet the requirements of 40 CFR § 141.403(b)(3)(i)(A).

7. A groundwater system may discontinue 4-log treatment of viruses if the State determines and documents in writing that 4-log treatment of viruses is no longer necessary for that groundwater source. A system that discontinues 4-log treatment of viruses is subject to the source water monitoring and analytical methods requirements of Subpart S, § 141.402.

8. Failure to meet the monitoring requirements of this section is a monitoring violation and requires the groundwater system to provide public notification under Subpart S, § 141.402.

9. A groundwater system conducting compliance monitoring under 40 CFR § 141.403(b) must notify the State any time the system fails to meet any State-specified requirements including, but not limited to, minimum residual disinfectant concentration, membrane operating criteria or membrane integrity, and alternative treatment operating criteria, if operation in accordance with the criteria or requirements is not restored within four hours. The groundwater system must notify the State as soon as possible, but in no case later than the end of the next business day. (5) **Treatment Technique Violations for Groundwater Systems.** 40 CFR, Subpart S, § 141.404 is hereby incorporated by reference.

(a) A groundwater system with a significant deficiency is in violation of the treatment technique requirement if, within 120 days of receiving written notice from the Division of the significant deficiency, the system:

1. Does not complete corrective action in accordance with any applicable Division plan review processes including interim actions and measures specified by the Division, or

2. Is not in compliance with a Division approved corrective action plan and schedule.

(b) Unless the Division invalidates a fecal positive groundwater source sample under 40 CFR § 141.402(d), a groundwater system is in violation of the treatment technique requirement if, within 120 days of meeting the conditions of 40 CFR § 141.403(a)(1) or § 141.402(a)(2), the system:

1. Does not complete corrective action in accordance with any applicable Division plan review processes including interim actions and measures specified by the Division, or

2. Is not in compliance with a Division approved corrective action plan and schedule.

(c) A groundwater system subject to the requirements of 40 CFR § 141.402(a)(2) that fails to maintain at least 4-log treatment of viruses (using inactivation, removal, or a combination of the two) technique requirement if the failure is not corrected within four hours of determining the system is not maintaining at least 4-log treatment of viruses before or at the first customer.

(d) Groundwater systems must give public notification under 40 CFR § 141.203 for the treatment technique violations specified in paragraphs (a), (b) and (c) of this section.

(6) Reporting and Recordkeeping for Groundwater Systems.

40 CFR, Subpart S, § 141.405 is hereby incorporated by reference.

(a) In addition to the requirements of 40 CFR § 141.31, a groundwater system regulated under this subpart must provide the following information to the Division:

1. A groundwater system conducting compliance monitoring under 40 CFR § 141.403(b) must notify the Division any time the systems fails to meet any State-specified requirements including, but not limited to, minimum residual disinfectant concentration, membrane operating criteria or integrity, and alternative treatment operating criteria, if operation in accordance with the criteria or requirements is not restored within four (4) hours. The groundwater system must notify the State as soon as possible, but in no case later than the end of the next business day.

2. After completing any corrective action under 40 CFR § 141.403(a), a groundwater system must notify the State within thirty (30) days of completion of the corrective action.

3. If a groundwater system is subject to the requirements of 40 CFR § 141.402(a) does not conduct source water monitoring under 40 CFR § 141.402(a)(5)(ii), the system must provide documentation to the Division within thirty (30) days of the total coliform positive sample that it met the State criteria.

(b) In addition to the requirements of 40 CFR § 141.33, a groundwater system regulated under this subpart must maintain the following information in its records:

1. Documentation of corrective actions. Documentation shall be kept for a period of not less than ten years.

2. Documentation of notice to the public as required under 40 CFR § 141.493(a)(7). Documentation shall be kept for a period not less than three years.

3. Records of decisions under 40 CFR § 141.402(a)(5)(ii) and records of invalidation of fecal indicator-positive groundwater samples under 40 CFR § 141.402(d). Documentation shall be kept for a period of not less than five years.

4. For consecutive systems, documentation of notification to the wholesale system(s) of total-coliform positive samples that are not invalidated under 40 CFR § 141.21(c). Documentation shall be kept for a period of not less than five years.

5. For systems, including wholesale systems, that are required to perform compliance monitoring under 40 CFR § 141.403(b):

(i) Records of the State-specified minimum disinfectant residual. Documentation shall be kept for a period of not less than ten years.

(ii) Records of lowest daily residual disinfectant concentration and records of the date and duration of any failure to maintain the State-prescribed minimum residual disinfectant concentration for a period of more than four hours. Documentation shall be kept for a period of not less than five years.

(iii) Records of State-specified compliance requirements for membrane filtration and of parameters specified by the Division for State-approved alternative treatment and records of the date and duration of any failure to meet the membrane operating, membrane integrity, or alternative treatment operating requirements for more than four hours. Documentation shall be kept for a period of not less than five years.

(7) **Division Recordkeeping.** The records kept by the Division shall be in accordance with 40 CFR § 142.14.

(8) **Division Reporting.** The reporting by the Division shall be performed as required by 40 CFR § 142.15.

Authority O.C.G.A. Sec. 12-5-170 *et seq.* **History.** Original Rule entitled "Ground Water Rule" adopted. F. May 27, 2009; eff. June 16, 2009. **Amended:** F. Jan 8, 2014; eff. Jan 28, 2014.

MINIMUM STANDARDS

FOR

PUBLIC WATER SYSTEMS

May, 2000

Drinking Water Permitting & Engineering Program Georgia Environmental Protection Division 205 Butler Street, S.E. Floyd Towers East, Suite # 1362 Atlanta, Georgia 30334

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MINIMUM STANDARDS FOR PUBLIC WATER SYSTEMS

FOREWORD

This publication has been prepared to provide minimum design criteria and establish certain standards in the development and construction of public water supply systems. This document would help water system owners, operators, professional engineers, and the public in general understand about the standards used in the design and construction of public water supply systems. We consider these standards to be dynamic and subject to periodic updates and revisions, as necessary, to conform with the latest drinking water regulations. If you are planning to develop a new public water supply system, or make additions, extensions, repairs, improvements or modifications to an existing public water system, please make sure that you are using the latest edition of the "Minimum Standards for Public Water Systems".

There has been no attempt to include or address every situation in this publication. Certainly, there may be occasions when these standards may not apply or cover. In those circumstances, the design of the facilities should meet the needs of the particular situation. Nothing in these minimum standards should be construed as preventing the professional engineer from recommending or the Georgia Environmental Protection Division from approving more effective treatment where local conditions dictate such action. You must contact the Drinking Water Permitting and Engineering Program of the Division for clarification and guidance prior to any construction. Any exceptions will be handled on an individual basis. However, it must be understood that development and operation of all public water systems are required, by law, to comply with the Georgia Rules for Safe Drinking Water, Chapter 391-3-5, promulgated under the Georgia Safe Drinking Water Act.

Should at any time an experimental installation, made based on engineering data, fail to produce results satisfactory to the Division, then immediate steps must be taken to replace it by a conventional installation approved by the Division.

The term "Division" as used herein refers to the Georgia Environmental Protection Division, Drinking Water Permitting and Engineering Program. Other terms, such as "shall" and "must" are intended to mean mandatory procedures. The terms "should," "recommended," and "preferred," indicate desirable procedures or methods.

The Recommended Standards for Water Works, 1992 Edition, "Great Lakes Upper Mississippi River Board of State Public Health & Environmental Managers", commonly known as the "Ten-State Standards" were used as a guide in the preparation of Georgia's Minimum Standards for Public Water Systems.

ACKNOWLEDGEMENTS and REFERENCES

We have reviewed standards from various state drinking water agencies along with a number of other nationally accepted standards for inclusion in the development of this document. Therefore, these standards are a compilation of information from the current Georgia Rules for Safe Drinking Water, Chapter 391-3-5, and a number of other acceptable sources as listed below:

- 1. Georgia Rules for Safe Drinking Water, Chapter 391-3-5, October 16, 1997.
- 2. Recommended Standards for Water Works, 1992 Edition, "Great Lakes Upper Mississippi River Board of State Public Health & Environmental Managers", commonly known as "Ten-State Standards".
- 3. American Water Works Association (AWWA) Standards, 1992 Edition.
- 4. "Guidance Manual for Compliance With the Filtration and Disinfection Requirements for Public Water Systems using Surface Water Sources", U.S.E.P.A., October, 1990.
- 5. "Manual of Small Public Water Supply Systems", U.S.E.P.A., Office of Water, May, 1991.
- 6. "Small System Compliance Technology List for the Surface Water Treatment Rule", U.S.E.P.A., Office of Water, August, 1997.
- Small Water Systems Serving the Public Manual (correlated with National Drinking Water Regulations), Conference of State Sanitary Engineers in cooperation with Office of Drinking Water, U.S.E.P.A., July, 1978.
- 8. Tennessee Department of Environment and Conservation, "Community Public Water Systems Design Criteria", 1997.
- 9. North Carolina Department of Environment, Health, and Natural Resources, "Rules Governing Public Water Systems", Subchapter 18C-Water Supplies, August 1, 1996.
- 10. "Design Standards for Public Water Supply Systems", Environmental Health Services, Division of Sanitary Engineering, West Virginia State Department of Health, January 1, 1970.
- 11. "Georgia's Requirement for Business Plans", Georgia Department of Natural Resources, Environmental Protection Division, Memorandum, Edward Urheim, Drinking Water Permitting and Engineering Program, July 23, 1999.
- 12. Iowa Department of Natural Resources, Water Supply Section, "Self-Assessment Manual for Iowa Water System Viability", December 1, 1997.
- 13. "Guidance on Implementing the Capacity Development Provisions of the Safe Drinking Water Act Amendments of 1996", U.S.E.P.A., Office of Water, July 1998.
- Pennsylvania Department of Environmental Protection, Bureau of Water Supply Management, "Public Water Supply Manual, Part V-Section I and II - Operations and Maintenance (ID No. 383-3110-111)", November 1, 1997.
- 15. Pennsylvania Department of Environmental Protection, Bureau of Water Supply Management, "Public Water Supply Manual, Part V (Appendix A) Operations and Maintenance for Small Groundwater Systems (ID No. 383-3110-211)", May 1, 1999.

APPROVAL REQUIREMENTS FOR PUBLIC WATER SYSTEMS

The following is Section 391-3-5-.04 of the Georgia Rules for Safe Drinking Water, which outlines the "Approval Requirements" for public water supply systems in Georgia.

(1) No person shall erect, construct, or operate a public water system, nor undertake substantial enlargements, extensions, additions, modifications, renovations or repairs to any public water system, including storage, distribution, purification, or treatment components, without having first secured the Division's approval of: the source of water supply; the means and methods of treating, purifying, storing and distributing said water; and obtaining a permit to operate a public water system, except as provided by paragraph (2) of this Section. The approval of the Director must be obtained prior to the dividing of a public water system. For purposes of these rules "substantial" as used in this Section shall not include routine maintenance.

(2) Governmentally owned public water systems and water authorities with qualified staff and meeting operating criteria developed by the Division may, with prior approval from the Division, approve limited additions to the water system. These additions will be limited to water distribution lines to serve subdivisions, apartment complexes and shopping centers. Additions approved by the water system must be reported annually in a format prescribed by the Division.

(3) Before a person may initiate construction of a new public water system or increase the capacity of an existing public water system, the person shall notify the local government in which the system is located and obtain the local government's approval for development of the project within its jurisdiction, prior to the submittal of the plans and specifications to the Division for approval. To the extent practicable, the person should avoid locating part or all of the new or expanded facility at a site which:

- (a) is subject to a significant risk from earthquakes, floods, fires or other disasters which could cause a breakdown of the public water system or a portion thereof; or
- (b) except for intake structures, is within the floodplain of a 100-year flood or is lower than any recorded high tide where appropriate records exist; or
- (c) is on or in close proximity to an abandoned landfill or any other site used for waste disposal.

(4) The requirements of this paragraph shall apply to all non-governmentally owned community public water systems that have been issued a permit to operate by the Director or have applied for a permit before January 1, 1998. To assure the continuity of operation and maintenance of a non-governmentally owned and operated public water system when the water customers own the property being served by the supplier, the supplier of the water system shall file with the Division an executed Trust Indenture as prescribed by the Division and approved by the Director. The Trustee should preferably be a governmental authority. When a governmental authority is not available, the Trustee should be a property owners association organized to guarantee the operation and maintenance of the public water system. The association must be

made up of members who are owners of properties served by the water system. The Articles of Incorporation and By-Laws of the association are to be submitted to the Division for review and/or approval. If a Trustee other than a unit of local government or property owners association is proposed, it will be necessary to determine that there is no identity-of-interest between the owner of the system and the Trustee. For new or proposed systems, the legal documents shall be submitted with the plans and specifications. When the supplier is or desires to serve water to property not individually owned by the water customer, a legal document assuring the continuity and maintenance of operation may not be required.

(5) Any person who desires to own or operate or who desires to commence the operation of a public water system shall first evaluate connecting to an existing local governmentally owned and operated public water system.

(6) No approval of the plans and specifications for the development of a separate source of water supply or the construction of the water system will be made and no permit to operate will be issued until the owner has provided acceptable certification to the Division outlining the reasons why the system cannot connect to an existing local governmentally owned water system.

(7) Beginning January 1, 1998, the Division shall require compliance with the following conditions prior to the issuance of the initial permit to operate to a new privately owned community public water system:

(a) The owner shall provide written certification from the local government in which the system is located, that the local government is in concurrence with the development of the privately owned community public water system. The certification shall be provided to the Division with the submission of the permit application and prior to or concurrently with the submission to the Division of the plans and specifications for construction of the proposed public water system.

(b) The owner must retain a Professional Engineer, registered in the State of Georgia, to prepare plans and specifications for approval by the Division for the construction of the proposed public water system, and the owner shall submit to the Division a certification from the engineer that the water system was constructed according to the plans and specifications approved by the Division. The public water system must be designed and constructed in accordance with the Division's "Minimum Standards for Public Water Systems", latest edition.

(c) The owner must submit to the Division for approval, a multi-year "business plan" (see Appendix A) which adequately demonstrates the water system's managerial and financial capacity to comply with all drinking water regulations in effect, or likely to be in effect. The "business plan" shall be prepared in accordance with Appendix A of this publication. The "business plan" shall be updated at intervals determined by the Director.

(d) The owner must provide an approved back-up water source, such as an additional well, capable of providing adequate water service if the primary source becomes nonfunctional. The requirement for an approved back-up water source may be waived by the Director for systems with less than 25 service connections.

(e) The owner must submit a copy of a trust indenture or other legal agreement approved by the Division that has been executed with the local government in which the system is located, which assures the operation and maintenance of the public water system in compliance with the drinking water regulations established pursuant to the Act. For acting as the Trustee of the water system, the local government may at its discretion require the owner to provide a trust fund, performance bond, or irrevocable letter of credit. No later than one year after the public water system commences operation and at least every two years thereafter, the owner must submit to the Division and the Trustee the results of an evaluation, by a third party acceptable to the Division, of the water system's financial, technical, and operational capability to meet the current and future needs of the water system's customers and the drinking water regulations established pursuant to the Act. Upon written notification by the Division to the owner of violations of the regulations established pursuant to the Act and/or deficiencies in the financial, technical and/or operational status of the water system, the owner shall have a reasonable period of time to correct all said violations and deficiencies to the Division's satisfaction. Should the owner fail after a reasonable period of time after receiving written notice to correct violations of the drinking water regulations established pursuant to the Act and/or deficiencies in the financial, technical and/or operational capability of the system, the Trustee under the conditions of the trust indenture may use funds from the trust fund, performance bond or irrevocable letter of credit to obtain compliance with the said regulations and/or correct said deficiencies. In addition, if the water system owner fails after a reasonable period of time to correct all said violations and deficiencies, under the conditions of the trust indenture the Trustee may assume ownership of the public water system in order to assure that the water system is properly maintained and operated for the benefit of the system's customers. For new or proposed community water systems, the legal documents shall be submitted with the plans and specifications.

(f)If the local government is not available or agreeable to be the Trustee for a proposed privately owned community public water system, written documentation from the local government certifying it has no desire to act in this capacity shall be provided to the Division. When the local government is not available or agreeable to be the Trustee, the owner shall obtain a Trustee acceptable to the Division and execute a trust indenture or other legal agreement approved by the Division. If a Trustee other than a local government or a property owners association is proposed, it will be necessary for the owner and the Trustee to certify in writing to the Division that there is no identity-ofinterest between the owner of the system and the Trustee. For acting as the Trustee of the water system, the Trustee may at its discretion require the owner to provide a trust fund, performance bond, or irrevocable letter of credit. No later than one year after the public water system commences operation and at least every two years thereafter, the owner must submit to the Division and the Trustee the results of an evaluation, by a third party acceptable to the Division, of the water system's financial, technical, and operational capability to meet the current and future needs of the water system's customers and the drinking water regulations established pursuant to the Act. Upon written notification by the Division to the owner of violations of the regulations established pursuant to the Act and/or deficiencies in the financial, technical and/or operational status of the water system, the owner shall have a reasonable period of time to correct all said violations and deficiencies to the Division's satisfaction. Should the owner fail after a reasonable period of time after receiving written notice to correct violations of the drinking water regulations established pursuant to the Act and/or deficiencies in the financial, technical and/or operational capability of the system, the Trustee under the conditions of the trust indenture may use funds from the trust fund, performance bond or irrevocable letter of credit to obtain compliance with the said regulations and/or correct said deficiencies. In addition, if the water system owner fails after a reasonable period of time to correct all said violations and deficiencies, under the conditions of the trust indenture the Trustee may assume ownership of the public water system in order to assure that the water system is properly maintained and operated for the benefit of the system's customers. For new or proposed community water systems, the legal documents shall be submitted with the plans and specifications.

(8) Products added directly to drinking water for its treatment or introduced indirectly into drinking water through its contact with surfaces of materials or products used for its treatment, storage, transmission, or distribution shall not adversely affect drinking water quality and public health.

(a) All treatment chemicals that come into contact with drinking water shall be certified for conformance with American National Standards Institute/National Sanitation Foundation Standard 60 (ANSI/NSF Standard 60) by an American National Standards Institute (ANSI) approved third-party certification program or laboratory.

(b) All products that come into contact with drinking water during its treatment, storage, transmission or distribution shall be certified for conformance with American National Standards Institute/National Sanitation Foundation Standard 61 (ANSI/NSF Standard 61) by an American National Standards Institute (ANSI) approved third-party certification program or laboratory.

PART 1 - SUBMISSION OF ENGINEERING DOCUMENTS

1.1.1 <u>GENERAL</u> - For any activity listed in Section 391-3-5-.04 of the Rules for Safe Drinking Water (see Introduction section in the previous pages), an engineering report prepared by a professional engineer shall be submitted to the Division prior to the preparation of the final construction plans and specifications. Plans and specifications shall be prepared by a professional engineer, licensed in the state of Georgia, and submitted to the Division in duplicate, accompanied by a letter of submittal identifying the project, owner and owner's address. No construction shall be initiated without prior approval from the Division.

The documents submitted for the Division's review and approval shall include:

- a. A summary of the basis of design; hydraulic calculations and profiles;
- b. Operation requirements, where applicable;
- c. General layout;
- d. Detailed plans;
- e. Detailed material and construction specifications;
- f. Description and drawing for erosion and sedimentation control in accordance with the Georgia Erosion and Sedimentation Act, as amended, and local soil and sedimentation control ordinances (when applicable). Land Disturbance permits must be obtained from the appropriate authority prior to commencing the land disturbance activity; and,
- g. Operating permit application and/or water withdrawal application and/or business plan and/or other pertinent documentation from the local government, as may be necessary or required by the Rules for Safe Drinking Water, Chapter 391-3-5.

1.1.2 <u>PRIVATELY OWNED WATER SYSTEMS</u>: Those projects that are proposing to develop new privately owned community public water systems shall also include the following additional documents in their submittals for the Division's review and approval:

- a. A written certification by the owner, supported by proper documentation, outlining the reasons why the proposed system cannot connect to an existing local governmentally owned water system;
- b. A written certification from the local government concurring with the development of the privately owned community public water system within its jurisdiction;
- c. A "business plan" which adequately demonstrates the water system's managerial and financial capacity to comply with all drinking water regulations in effect, or

likely to be in effect. The "business plan" shall be prepared in accordance with Appendix A of this book and shall be updated at intervals determined by the Director.

d. A recorded copy of an executed trust indenture or other legal agreement approved by the Division that has been executed with the local government in which the system is located. In the event the local government is not available, another trustee (acceptable to Division) can be used to assure the operation and maintenance of the system in conformance with the drinking water regulations.

1.1.3 <u>EXCEPTION</u> - The engineering report and/or plans and specifications may be waived by the Director when information submitted by the supplier of water allows an engineering appraisal of the proposed activity to be made by the Division as follows:

- a. For minor extensions, additions and/or modification to an existing governmentally owned public water system which does not effect the normal operation of said water system.
- b. For new public water systems which are classified as transient non-community water systems (TNCWS) and for additions to existing transient non-community water systems (TNCWS).

1.2.0 <u>ENGINEERING REPORT</u> - The engineering report shall contain a comprehensive description of the proposed activity including, but not limited to, the following:

- a. Scope and description of proposed activity,
- b. A summary of the alternative solutions, if applicable,
- c. Recommendations,
- d. Where pertinent, the following information should be included in the engineering report:
 - 1. General description of the existing water system service areas;
 - 2. Description of the proposed source of water supply, and data concerning the quality of the water, as well as water consumption data;
 - 3. Pertinent information regarding present available sources of water supply, water treatment facilities, and existing public water systems;
 - 4. Sufficient maps, diagrams, charts, tables, calculations, basis of design data and graphs to make the report readily understandable; all sheets shall be descriptively labeled and bound together or folded in a folder attached to the report;

- 5. Operational and maintenance program description;
- 6. The known character and depth of the natural earth formations through and from which ground water sources are to be developed;
- 7. Factors which may effect the quality of a source of water supply as determined by a survey of the water shed above the surface water intake or the surrounding area of a ground water source;
- 8. A multi-year "business plan" (see Appendix A) to adequately demonstrate that the system has the financial, technical, and managerial capability to comply with all the federal and state drinking water regulations in effect, or likely to be in effect and to maintain compliance with the regulations after completion of the proposed activity.

1.2.1 <u>PLANS and SPECIFICATIONS</u> - Plans and specifications must be submitted in duplicate (with additional copies as may be requested) to the Division for its review and approval prior to the construction of the project. These plans and specifications must carry the stamp of a registered engineer or other registered professional licensed and authorized in the State of Georgia and duly qualified and capable of designing water systems and computing flows and pressures in the proposed water system projects. The plans and specifications shall include, but not be limited to the following:

- a. Map plans of the area to be served by the public water system, including, but not limited to: geographical location of the project, location of all existing and proposed streets in the area to be served, location of the source of water supply and the treatment facilities, and elevations of the principal parts of the public water system;
- b. Detailed plans of the location and the construction of the storage tank, water mains, valves, fire hydrants and appurtenances;
- c. Detailed plans of: the location and construction of the water treatment facilities including layout and relationship of the various units of the treatment facility; general piping, pumps, reservoirs, flow measuring devices, controls, points of chemical application, water sampling points, plant control laboratory, chemical feed equipment and chemical storage area. Sufficient dimensions and elevations shall be provided to make all parts of the plans readily understandable;
- d. The dimensions of the plan sheets must be within the following limits: twenty (20) to thirty (30) inches in height and twenty-four (24) to forty-two (42) inches in length, and shall be of sufficient clarity to be microfilmed;
- e. Each plan sheet shall have printed thereon the name and location of the public water system, name and registration stamp of the professional engineer, scale, true and magnetic north, and shall be bound together and numbered consecutively;

- f. If the plans are solely for extensions to an existing public water system, only such information as is necessary for comprehension of the plans and construction of the project will be required;
- g. Specifications will be separate from the plans and shall have printed thereon the name and location of the public water system, name and stamp of the professional engineer, and shall be bound together and numbered consecutively;
- h. Specifications for the construction of the public water system shall accompany all plans for new or existing public water systems and shall describe the plans for the whole and for each unit or component of construction of the proposed public water system, including where necessary, testing and disinfection, painting, laboratory equipment, metering and recording devices and related material;
- i. The specifications may be omitted for extensions or additions to existing systems provided the proposed construction is in accordance with specifications previously approved and on file with the Division;
- j. Manufacturers' brochures of specifications of materials are not acceptable for purposes of this requirement.

1.2.2 <u>CHANGES IN PLANS and SPECIFICATIONS AFTER APPROVAL</u> - Any significant deviation from the approved plans or specifications affecting capacity, hydraulic conditions, operating units, the functioning of water treatment processes, the quality of water to be delivered, or any provisions stipulated in the Division's original and subsequent letters of approval must receive prior approval by the Division before any construction or installation.

1.2.3 <u>ENGINEER'S CERTIFICATION</u> - Upon completion of the construction or modification, the water supplier shall submit a statement from the registered professional engineer and affixed with his professional engineering seal stating that construction was completed in accordance with the approved plans and specifications. The statement shall be based upon observations during and upon completion of construction by the engineer or a representative of the engineer's office who is under the engineer's supervision.

PART 2 - PROCEDURES FOR DEVELOPING PRIVATELY OWNED COMMUNITY PUBLIC WATER SYSTEMS THAT ARE USING GROUND WATER (WELLS, SPRINGS) AS SOURCES OF WATER SUPPLY

2.1.0 <u>GENERAL</u>: Any person who desires to own or operate or who desires to commence the operation of a public water system must first evaluate connecting to an existing local governmentally owned and operated public water system, provided:

- a. the existing public water system is within close proximity (approximately one mile or less) of the proposed water system is; and,
- b. the existing public water system is capable of furnishing the drinking water under adequate water pressure and flow.
- c. When, if a governmentally owned and operated public water supply system is not available, then the items listed below under Phases I, II, III and IV must be satisfied.

2.1.1 <u>PHASE I</u> - INQUIRY & DISCOVERY SUBMITTALS:

- a. a map showing the geographical location of the proposed project, as well as the location of the governmentally owned and operated public water system closest to the project site;
- b. documentation outlining the reasons why the proposed project cannot connect to an existing local governmentally owned water system. A written letter from the nearest governmentally owned City or County water system, denying the owner's request for water service must be attached;
- c. written certification from the local government concurring with the development of the privately owned community public water system within its jurisdiction;
- d. when applicable, a written concurrence by the nearest governmentally owned water supply system to provide water to the proposed project. The party that will own, operate and maintain the water distribution lines must be clearly stated;
- e. a letter, written by the local county government, certifying that the proposed water system development project and the appurtenances pertaining to the water system, are not located on or in close proximity to an abandoned landfill or any other site used for waste disposal;
- f. a detailed description of the proposed development project, including the type (residential, mobile home, school, etc.) and the total number of service connections proposed for development, and the type, number and projected capacity of water

supply source(s), water use estimates, and the proposed means for the disposal of wastewater generated by the project (individual septic tank system or central wastewater system).

<u>NOTE</u>: If all of the requested information (identified under "Phase I") not received within 90 days from the date of correspondence from the Division, no further consideration will be given for the proposed water system development project. For reconsideration, a separate inquiry must be made to the Drinking Water Permitting and Engineering Program.

2.1.2 <u>PHASE II</u> - TECHNICAL REVIEW SUBMITTALS

- a. All engineering documents must be prepared as specified in this document by a professional engineer licensed to practice in the state of Georgia. Please refer to Part 1, titled "Submission of Engineering Documents" in this publication and the Georgia Rules for Safe Drinking Water, Chapter 391-3-5.
- b. Additional "special" requirements may apply to those systems that are proposed for construction in the coastal region of Georgia. For those specific requirements, please contact the Environmental Protection Division.
- c. The following shall be submitted, as applicable:
 - 1. detailed plans and specifications for the construction of the water system, including material and construction methods for the water source installation, pump house, pumping equipment, electrical controls, storage tanks, paint coating system, water treatment equipment, distribution lines, service connections, valves, disinfection and other related information;
 - 2. a "business plan" (see Appendix A) which adequately demonstrates the water system's managerial and financial capacity to comply with all drinking water regulations in effect, or likely to be in effect. The "business plan" shall be prepared in accordance with Appendix A of this publication and shall be updated at intervals determined by the Director;
 - 3. "basis of design data" and "design calculations."

2.1.3 <u>PHASE III</u> - SOURCE APPROVAL SUBMITTALS

1. Submit a "Well Data Sheet" for the well, completed and signed by the water well contractor. The contractor must be licensed to construct water wells in the State of Georgia in accordance with the provisions of the Water Well Standards Act; 2. Physical and chemical "screening" of the raw water must be performed for the following parameters (with the concentrations shown in milligrams per liter (mg/1), where applicable) by an acceptable water laboratory, and a copy of the results submitted to this office:

pН	Zinc
Alkalinity (as CACO ₃)	Iron
Hardness (as CACO ₃)	Manganese
Chloride	Sulfate
Fluoride	Turbidity (NTUs)
Nitrate (as N)	Carbon dioxide
Nitrite (as N)	Color (color units)
Total Nitrate & Nitrite (as N)	Total Dissolved Solids

This "screened" analysis must be performed as an interim measure to determine usability of the well/spring as a potential source of water supply, until an in-depth testing of the water is completed as required by the U.S.E.P.A.'s Standardized Monitoring Framework;

- 3. A raw water sample must be collected from the proposed source and submitted to the Division's Water Supply Laboratory or other Division approved laboratory for microbiological analysis. A copy of the results must be submitted to the Drinking Water Permitting and Engineering Program;
- 4. A raw water sample must be collected in a specially marked one gallon plastic container and submitted to the Division's Radiological Laboratory for radiological analysis. The plastic container, necessary forms and instructions for this sampling are sent under separate cover.
- 5. Under certain circumstances, the Drinking Water Permitting and Engineering Program may request additional or special sampling of the proposed water source for physical, microbial, radiological and chemical analyses, including in-depth evaluation of the proposed water source for the influence of surface water.
- 6. In order to obtain a "microbiological sampling case" from the EPD laboratory, a "Water Sample Shipping Case Request" form must be completed and returned to either the Drinking Water Permitting and Engineering Program or the EPD Water Laboratory with a check or money order in the amount of \$25.00, which is made payable to the Georgia Department of Natural Resources.
- 7. Those systems with a design capacity to use 100,000 gallons of water per day are required to make an application to obtain (or modify the existing) permit to use either groundwater or surface

water to reflect the addition of the new water source(s) and/or any change in the water withdrawal amount. Please contact the Division's Water Resources Management Program at (404) 656-3094 concerning requirements for the water withdrawal permit.

2.1.3.1 ADDITIONAL REQUIREMENTS FOR CITIES, COUNTIES and WATER AUTHORITIES:

- 8. Description of how the erosion and sedimentation control will be accomplished during and after construction of this project. Compliance with Act 599, "The Erosion and Sedimentation Act" (O.C.G.A. 12-7-1 et. seq.) is required. A land disturbing activity permit must be obtained (either from local government or EPD, as applicable) prior to start of any construction.
- 9. For any well or spring to be developed as a community public water supply source for a municipality, county, or an authority, written documentation must be provided from the EPD's Geologic Survey Branch [Tel# (404) 656-3214] that an appropriate wellhead protection area has been delineated and an inventory of potential pollution sources in the wellhead protection area of the proposed well/spring has been completed

<u>NOTE</u>: If all of the requested information (identified under "Phases II and III") is not received within one (1) year from the date of receipt of correspondence from the Drinking Water Permitting and Engineering Program, no further consideration will be given for the proposed water system development project. For reconsideration, a separate inquiry must be made to the Drinking Water Permitting and Engineering Program.

2.1.4 PHASE IV - PERMITTING & CONTRACT SERVICES SUBMITTALS

- a. An "Application for a Permit to Operate a Public Water System" must be completed, signed and returned to the Drinking Water Permitting and Engineering Program.
- b. Provide proof of ownership (a copy of warranty deed or bill of sale), when applicable.
- c. To assure continuity of maintenance and operation of a nongovernmentally owned community water system in compliance with the current and future state and federal drinking water regulations, the owner must submit a recorded copy of an executed TRUST INDENTURE or other legal agreement approved by the Division. This legal document should be executed with the local government in which the system is located. In the event the local government is not available, another trustee (acceptable to Division) can be used to assure the operation and maintenance of the system in conformance with the regulations. Please

refer to the Rules for Safe Drinking Water, Chapter 391-3-5, concerning this requirement.

d. To obtain a "Drinking Water Service Contract", please contact the Drinking Water Program Fee Coordinator at (404) 656-4807. Under this "optional" contract, Georgia Environmental Protection Division (EPD) will provide for the laboratory and related services consistent with the OWNER's need to comply with the National Primary and Secondary Drinking Water Regulations and related regulations in the Georgia Rules for Safe Drinking Water, Chapter 391-3-5. Entering into this contract is not a condition or prerequisite to the permit nor will stop or prevent EPD from fulfilling its regulatory functions with regard to the public water system.

PART 3 - PROCEDURES FOR ADDITIONS AND EXTENSIONS TO PUBLIC WATER SYSTEMS

3.1.1 <u>GENERAL</u>: All engineering documents must be prepared as stated in this document by a professional engineer licensed to practice in the state of Georgia. Please refer to Part 1, titled "Submission of Engineering Documents" in this publication and the Rules for Safe Drinking Water, Chapter 391-3-5. Additional "specific" requirements may apply to those systems that are proposed for construction in the coastal region of Georgia. For those specific requirements, please contact the Environmental Protection Division.

The following shall be submitted, as applicable:

- a. detailed plans and specifications for the construction of the water system project. Engineering plans must be applicable to the project and may include water supply sources [i.e.well(s), spring(s)], treatment, storage, distribution system indicating the size of all water lines, valves, feeder mains, service lines, blow-off valves, booster pump stations, point of tie-in, and any other information pertinent to the project. Specifications should pertain to materials, construction methods, disinfection and pressure testing of water lines, valves, pumps, controls, treatment and appurtenances, as applicable to the project. If previously approved standard specifications apply, a statement to that effect should be included in the submittal cover letter;
- b. when required by the Director, a "business plan" (see Appendix A) which adequately demonstrates the water system's managerial and financial capacity to comply with all drinking water regulations in effect, or likely to be in effect. The "business plan" shall be prepared in accordance with Appendix A of this publication and shall be updated at intervals determined by the Director, as specified in Section 391-3-5-.04 of the Rules for Safe Drinking Water;
- c. "basis of design data", as well as "design calculations" and "hydraulic analysis" for the project;
- d. "evidence of availability of water". Requests for approval of subdivisions (connecting to existing distribution systems) must include documentation that the project has been coordinated with the supplying water system. A twenty-four hour pressure test chart and flow information which was taken at a point nearest to the tie-in of the existing system, must be submitted.
- e. a copy of the completed form, titled "Water System Addition and Expansion Form". All applicable information pertinent to the project must be provided on this form.

3.1.2 WATER SYSTEM ADDITION and EXPANSION FORM

General information				
Project Name:			WSID No.:	
Project Location:			County:	
Latitude:Lor	igitude:	(v	wells only)	
Developer:		-		
Type of Development:				
Design Information				
Number of Sources:	Total Produ	ction Capac	ity:((gpm)
Number of Service Connections P	roposed:			
Number of Service Connections E	xisting:			
Treatment Type:				
Storage Type:	_ Total Volume:		(gallons)	
Maximum Elevation in Developm	ent:	(feet)		
Size(s) of Water Main in Project:		_(inches)		
Length of Water Main to be Instal	led:	(feet)		
Wastewater for this Project will b	e handled by: Septio	c Tank:	or Sewer System:	
If the project is to be supplied by	an existing water sy	stem, please	e include the following	5:
Water System Supplier's Name:		WSID Num	ber:	
Static Pressure (point of tie-in):	(psi) at _		feet elevation	
Elevation at the point of tie-in:	feet			
Flow Available:(gj	om) at	(psi)) residual	
Size of Water Main at Point of Tie	e-in to Project:			

PART 4 - GENERAL DESIGN CONSIDERATIONS

4.1.1 <u>PLANT LAYOUT</u> - System design shall consider:

- a. functional aspects of plant layout;
- b. provisions for future plant expansion;
- c. access roads;
- d. site grading;
- e. site drainage;
- f. walks;
- g. driveways and parking;
- h. chemical delivery.

4.1.2 <u>BUILDING LAYOUT</u> - Design shall provide:

- a. adequate ventilation, which is screened for insect protection;
- b. adequate lighting;
- c. adequate heating and air-conditioning;
- d. adequate drainage;
- e. dehumidification equipment as needed;
- f. accessibility of equipment for operation, servicing, and removal;
- g. flexibility of operation;
- h. operator safety, including safety railings;
- i. convenience of operation;
- j. consideration of chemical storage and feed equipment in separate rooms to reduce dust problems;
- k. separate facilities for laboratory procedures and office/lunch activities.

4.1.3 <u>STANDBY POWER</u> - Stand-by power generation may be required by the Division so that water may be treated and/or pumped to the distribution system during periods when there is a power outage.

4.1.4 <u>EQUIPMENT MAINTENANCE</u> - Adequate facilities shall be available for the maintenance and servicing of automation equipment.

4.1.5 <u>STORAGE AND SHOP SPACE</u> - Adequate facilities shall be included for shop space and storage consistent with the designed facilities.

4.1.6 <u>PROVISIONS FOR FUTURE EXPANSION</u> - Consideration shall be given to facilitate expansion and unknown future uses whenever pipes pass through walls of concrete structures.

4.1.7 <u>METERING</u> - All water systems shall have some means of metering the raw and finished water. In addition, all new services connected to community and nontransient, noncommunity water systems shall be metered. Existing services should be metered, if not metered already. In the event existing services are not metered, metering shall be performed when required by the Director of the Environmental Protection Division.

4.1.8 <u>SOURCE</u> - To enhance reliability of the water supply, all community public water systems with groundwater sources shall provide an approved back-up water supply source that is capable of providing adequate water service in the event the primary source becomes nonfunctional.

PART 5 - SOURCE DEVELOPMENT

5.1.1 <u>GENERAL</u> - In selecting a source of water to be developed, the design engineer must show, to the satisfaction of the Division, that the water which is to be delivered to the consumers shall meet the state and federal drinking water standards with respect to bacteriological, physical, chemical and radiological quality requirements. The Environmental Protection Division shall evaluate and approve proposed new sources before they are placed into service as drinking water sources.

- a. All sources of water supply must be adequate to meet anticipated growth. For human consumption in a community water system, one hundred (100) gallons per day for the projected population to be served at the end of the design period shall be considered adequate.
- b. Any community public water system using groundwater sources and serving 25 or more service connections shall provide an approved back-up water source, such as an additional well, capable of providing adequate water service if the primary source becomes nonfunctional.

5.2.0 <u>SURFACE WATER</u> - A surface water source includes all tributary streams and drainage basins, natural lakes and artificial reservoirs or impoundments above the point of water supply intake.

- 5.2.1 <u>QUANTITY</u> The quantity of water at the source shall:
 - a. be adequate to supply the water demand of the service area;
 - b. provide a reasonable surplus for the anticipated growth over a design period of 20 years;
 - c. be adequate to compensate for all losses.

5.2.2 <u>QUALITY</u> - A sanitary survey and study should be made of the factors, both natural and man made, which will affect quality. Such survey and study, shall include, but shall not be limited to:

- a. obtaining samples over a sufficient period of time to assess the bacteriological, physical, chemical and radiological characteristics of the water.
- b. assessing the degree of hazard to the supply by accidental spillage of materials that may be toxic, harmful or detrimental to the treatment processes.

c. complete the items listed under 5.2.2.1 which are considered minimum requirements for determining the acceptability of the proposed surface water source. Additional water quality monitoring, studies, investigations and evaluations should be conducted before selecting and/or designing appropriate treatment processes and technologies.

5.2.2.1 <u>GENERAL</u>: In accordance with Section 391-3-5-.06 of the Rules for Safe Drinking Water, promulgated under the Georgia Safe Drinking Water Act of 1977, the source of water supply for all public water systems must have the approval of the Environmental Protection Division. Before a proposed surface water supply can be considered for acceptance as a potential source of public water supply, the items below must be addressed to the satisfaction of the Division.

- a. A written request to evaluate the water supply as a potential source of public water supply and a map showing the geographical location of the proposed water intake must be submitted to the Drinking Water Program.
- b. A survey of the water drainage basin supplying the intake which addresses the current level of watershed protection; the nature of upstream land use; the existing and potential sources of pollution; and, other pertinent conditions which may have an impact on the use of the site as a potential water supply source must be submitted to the Division.
- c. One (1) raw water sample must be collected at least every two (2) weeks for six (6) months from a point most representative of the proposed intake location and submitted to the Division's Water Supply Laboratory or other Division approved laboratory for microbiological analysis [total coliform and fecal coliform or Escherichia coli (E. coli)] and turbidity. Additional samples must be collected after each rain event for microbiological and turbidity analysis, and any other parameter that would be considered pertinent due to geographical location of the intake.
- d. When required by EPD, one raw water sample shall be collected every month for six (6) months, from a point most representative of the proposed intake location and tested for *Giardia* cysts, *Cryptosporidium* oocysts, and Enteroviruses concentrations.
- e. One (1) raw water sample must be collected from the proposed intake location in a specially marked one gallon plastic container and submitted to the Division's Radiological Laboratory for radiological analysis. The plastic container, necessary forms and instructions for this sampling will be sent to you under separate cover.
- f. Physical and chemical screening of the proposed source water must be performed for at least for two (2) quarters for the following parameters (with the concentrations shown in mg/L, where applicable) by a water laboratory, and a copy of the results submitted to this office:

pH	Zinc
Alkalinity (as CACO ₃)	Iron
Hardness (as CACO ₃)	Manganese
Chloride	Sulfate
Fluoride	Turbidity (NTUs)
Nitrate (as N)	Carbon dioxide
Nitrite (as N)	Color (color units)
Total Nitrate & Nitrite (as N)	Total Dissolved Solids

This "screened" analysis is performed as an interim measure to determine usability of the proposed supply as a potential source of public water supply. Additional tests or in-depth water quality analysis may be required by state and federal drinking water regulations.

- g. When required by EPD, raw water samples shall be collected from the proposed intake location for two (2) quarters and tested for Total Organic Carbon (TOC), Total Organic Halide (TOX), Bromide and Ammonia.
- h. Contact the Drinking Water Permitting and Engineering Program for any special sampling requirements of the proposed water source for physical and/or chemical analyses.
- i. Upon completion of sampling of the proposed water source and water drainage basin survey, tabulate all the laboratory results (with special reference to fluctuations in quality and possible sources of contamination) and other pertinent findings in an engineering report and submit it to EPD along with the engineer's comments and treatment design recommendations. In addition to water source information, this engineering report should be comprehensive enough to include, but not limited to, general project information (i. e. water use, flow requirements, etc.); describe the nature and extent of the proposed water works project; discuss the alternate plans, giving reasons for selecting the one recommended; summarize and establish the adequacy of proposed treatment processes and unit parameters for the treatment of the specific water source under consideration (pilot studies, conducted over a sufficient time to treat under all expected raw water conditions throughout the year, may be necessary to demonstrate satisfactory performance); discuss the various wastes from the water treatment plant, their volume, proposed treatment and points of discharge; discuss the various sites considered and advantages of the recommended ones; summarize planning for future needs and services; etc.
- j. Submit an application to obtain a permit to use surface water. Please contact the Division's Water Resources Management Program at (404) 656-3094 concerning the water withdrawal permit requirements.

5.2.2.2 Please be reminded, the above outlined testing program is a basic screening process to evaluate the suitability of a surface source proposed for use as a public drinking water supply.

Additional water quality testing should be performed to determine treatment characteristics, chemical dosages, primary (and secondary coagulants), pH adjustments, etc. Information such as these, in conjunction with the source approval data, should be used to select and design appropriate water treatment technologies.

5.2.2.3 <u>STRUCTURES</u> - Intake structure design shall:

- a. provide withdrawal of water from more than one level;
- b. provide adequate protection against rupture by dragging anchors, ice, etc.;
- c. have motors and electrical controls located above grade and flood level except when submersible pumps are approved;
- d. be accessible;
- e. be designed against flotation;
- f. be equipped with removable or traveling screens before the pump suction well;
- g. provide chemical feed facilities (i.e. chlorine, potassium permanganate) for pretreatment and/or raw water transmission main, as necessary for water quality control;
- h. have intake valves and provisions for backflushing and testing for leaks, where practical;
- i. have provisions for surges where necessary;
- j. have provisions for sand or gravel removal;
- k. provide protection against any influence from a sewage outfall.

5.2.2.4 IMPOUNDMENTS AND RESERVOIRS

- a. Site preparation should provide for:
 - 1. removal of brush and trees to high water elevation;
 - 2. protection from floods during construction;
 - 3. clearing and grubbing small reservoirs.
- b. Construction may require:
 - 1. approval, obtained from the Division, of safety features for stability and spillway design of any structures;

2. a permit for controlling stream flow or the structure on the bed of a navigable stream or interstate water, to be obtained from the appropriate agency.

5.3.0 **<u>GROUND WATER</u>** - A ground water source includes all water obtained from drilled wells or springs. Dug, bored, or jetted wells are prohibited for all public water systems.

5.3.1 GENERAL

- a. The person constructing the well must be a licensed water well contractor in the State of Georgia in accordance with the provisions of the Water Well Standards Act of 1985 (O.C.G.A. 12-5-120, et. seq.). The contractor must maintain accurate driller logs, including material setting and grouting data, complete the results of the pump test, including water level measurements, and must furnish a signed copy of the results to the owner and to the Division on forms provided by the Division.
- b. Ground water sources (wells and springs) shall be evaluated for direct influence of surface water, when required by the Division.
- c. Two important concerns in the design of water wells must be adequately addressed:
 - 1. The provision for the proper depth to which the well casing shall be installed as a watertight conduit, and
 - 2. The provision for positive sealing of the annular space between the outside of the well casing and the well hole to prevent movement of water vertically along the outside of the well casing pipe. The well must be protected from contamination by surface waters and other sources of contamination.

5.3.2 WELLS SHALL BE LOCATED:

- a. generally at the highest point, and as far removed, and in a direction opposite to the ground water flow from any known or probable source of contamination;
- b. not less than fifty (50) feet from a septic tank;
- c. not less than one hundred (100) feet away from a septic tank absorption field;
- d. not less than ten (10) feet away from a sewer;
- e. not less than one thousand (1,000) feet away from a solid waste disposal site and not in a direction where ground water flow from the site may be intercepted by

the well;

- f. as far removed as possible from all open abandoned wells;
- g. not in areas of sink holes;
- h. not in the flood plain areas, unless adequate protection is provided to prevent submergence of the well casing, pumps and appurtenances;
- i. not less than 100 feet from surface water;
- j. not less than 100 feet from buildings, mobile homes, permanent structures, animal houses or lots, or cultivated areas to which chemicals are applied;
- k. not less than 100 feet from a chemical or petroleum fuel underground storage tank with secondary containment;
- 1. the Division may require greater separation distances or impose other protective measures when necessary to protect the well from any potential source of pollution, based upon: the hazard or health risk associated with the source of pollution; the proximity of the potential source to the well; the type of material, facility or circumstance that poses the source or potential source of pollution; the volume or size of the source or potential source of pollution; hydrogeological features of the site which could affect the movement of contaminants to the source water; the effect which well operation might have on the movement of contamination; and, the feasibility of providing additional separation distances or protective measures;
- m. the well, and the associated pumping and water treatment equipment shall be protected from unauthorized entry and use by an enclosed shelter or enclosed by a fence. The water treatment equipment shall be enclosed in a weatherproof shelter.

5.3.3 <u>WELL ABANDONMENT</u>

- a. Wells not used as sources of water supply shall be filled, plugged and sealed to protect against contamination of the ground water.
- b. Wells to be abandoned shall be sealed to prevent undesirable exchange of water from one aquifer to another.
- c. Preferably the well hole should be filled with neat cement grout.
- d. Have fill materials other than cement grout or concrete, disinfected and free of foreign materials.
- e. When filled with cement grout or concrete, these materials shall be applied to the well hole through a pipe, tremie, or bailer.

5.3.4 GENERAL WELL CONSTRUCTION

- a. All public water supply wells must be constructed in accordance with the requirements of the Georgia Rules for Safe Drinking Water, Chapter 391-3-5, by a water well contractor licensed in the State of Georgia.
- b. Pitless adapter wells shall not be constructed for public water supply systems.
- c. Wells shall be tested for plumbness and alignment in accordance with the latest edition of AWWA A100 Standard.
- d. Drilling fluids must be from an uncontaminated source or must be disinfected.
- e. All permanent casing, liners, screens and other manufactured material used in the well installation must be new. Material used shall preferably be wrought iron or steel.
- f. All casing and liner pipe joints shall be water tight the entire length in drilled wells. They shall have full circumferential welds or threaded coupling joints.
- g. The well casing shall neither terminate below ground nor in a pit.
- h. Packers shall be of a material that will not impart taste, odor, toxic substances or bacterial contamination to the water in the well.
- i. During the periods of stoppage of the well construction and when the site is unattended, the drilling contractor must have the well opening securely covered to prevent tampering and possible contamination. A welded metal plate is preferred for capping a well.
- j. During the well construction, the premises, construction material, tools and equipment must be maintained in a sanitary manner to prevent contamination of the well by the person excavating the well.
- k. The pump house floor shall be at least one foot above the original ground surface and not less than two feet above the highest known flood elevation.

5.3.4.1 STEEL CASING

a. Steel pipe well casing shall conform to American Society for Testing and Materials (ASTM) Specification A 120 or A 53 or American Petroleum Institute (API) Specification 5L or 5LS or equal standard and meet the following minimum wall thickness unless otherwise approved by the Division:

Nominal Casing Diameter (in inches)	Minimum Wall Thickness (in inches)
4	0.188
5	0.188
6	0.188
8	0.219
10	0.250
12	0.250
14	0.312
16	0.312
18	0.375
20	0.375
24	0.375

5.3.4.2 PLASTIC PIPE CASING

- a. The use of plastic well casing and screens must be approved by the Division prior to well installation.
- b. The plastic well casing and couplings shall meet the requirements of the ASTM Standard F 480 or equal standard and the National Sanitation Foundation standard for use with potable water.
- c. Any approved plastic well casing shall conform to the following minimum wall thickness:

Nominal Casing Diameter (in inches)	Minimum Wall Thickness (in inches)
4	0.265
4.5	0.291
6	0.390
8	0.508
10	0.632
12	0.750

d. The plastic well casing and screen shall not extend to a depth of greater than 300 feet below the ground surface.

5.3.4.3 CASING DEPTH AND GROUTING

a. The outer, permanent, protective casing shall extend at least five (5) feet into the first solid, unweathered or impervious subsurface rock strata encountered, and shall have a minimum length of twenty-five (25) feet from the ground surface into a well excavated into water-bearing formations in crystalline rocks and fifty (50)

feet in a well excavated into sedimentary water-bearing formations.

- b. The outer, permanent, protective casing shall be cement grouted its entire length with a cement slurry consisting of not more than six (6) gallons of water to one cubic foot of cement, plus standard additives, when necessary, to facilitate placing or setting. The neat cement shall conform to ASTM Standard C150.
- c. The outer protective casing shall be provided with sufficient guides or centralizers attached or welded to the casing to permit unobstructed flow and uniform thickness of grout.
- d. The guides or centralizers shall be attached to the bottom of the casing and at intervals not greater than 25 feet.
- e. The grout shall be placed under pressure by a positive displacement method, such as pumping, from the bottom of the annular space upward until the grout is extruded at the earth's surface in one continuous operation.
- f. The wall thickness of the cement grout surrounding the outer, permanent, protective casing shall be not less than one and one-half (1-1/2) inches at any point.
- g. Subsurface well construction shall cease for at least twenty-four (24) hours after grouting.

5.3.4.4. GRAVEL PACK WELLS

- a. The gravel for gravel-packed wells must be washed, free of organic matter, and composed of well rounded particles which are 95% siliceous material.
- b. Gravel shall be properly sized and disinfected immediately prior to or during placement.
- c. Gravel pack shall be placed in one uniform continuous operation.
- d. Gravel refill pipes, when used, shall be Schedule 40 steel pipe incorporated within the pump foundation and terminated with screwed or welded caps at least 12 inches above the pump house floor or concrete apron.
- e. Gravel refill pipes located in the grouted annular opening shall be surrounded by a minimum 1-1/2 inches of grout.
- f. Protection from leakage of grout into the gravel pack or screen shall be provided.

5.3.4.4.1 WELL SCREENS

- a. Shall be constructed of material which will not be damaged by the chemical action of ground water or future cleaning operations;
- b. Have the size of openings based on sieve analysis of the formation and/or based on the size of gravel if any artificial gravel pack is installed;
- c. Have sufficient length and diameter to provide adequate specific capacity and low aperture entrance velocity. Usually the entrance velocity should not exceed 0.1 feet per second;
- d. Be installed so that the pumping water level remains above the screen under all operating conditions;
- e. Be designed and installed to permit removal or replacement without adversely affecting the water-tight construction of the well;
- f. Be provided with a bottom plate or washdown bottom fitting of the same material as the screen.

5.3.4.5 <u>WELL DEVELOPMENT</u>

- a. The well shall be properly developed, disinfected, and pump tested by the drilling contractor.
- b. Development of the well shall accomplish removal of native silts and clays, drilling mud or finer fraction of the gravel pack, and shall continue until the maximum specific capacity is obtained from the completed well.
- c. Every well shall be tested for yield and drawdown. The static water level, drawdown and pumping water level must be measured.
- d. The well shall be test pumped at not less than the desired yield for a period of at least twenty-four (24) hours and shall continue for at least four (4) hours after the pumping level has stabilized.
- e. The methods of testing shall include but are not limited to the following:
 - 1. <u>Constant Discharge Method</u> This type of test is preferred for wells completed in unconsolidated aquifers. It is made by maintaining a constant rate of discharge equal to or greater than the desired yield of the well throughout the entire period of pumping. Measurements of pumping rate and water level shall be made every minute for the first 10 minutes of the test, every 2 minutes for the next 10 minutes, every 5 minutes for the next 40 minutes, every 15 minutes for the next hour, every 30 minutes for the next 3 hours, hourly for the remainder of the pumping period.

Recovery water-level measurements shall be made with the same frequency beginning with the cessation of pumping and continuing until complete recovery has occurred or until sufficient data have been collected to extrapolate full recovery.

- Step Drawdown Method This method is preferred for wells completed in 2. consolidated rock formations. It involves the well being "step" tested at rates approximately 1/2, 1, and 1-1/2 times the design capacity of the well. Each step should consist of equal periods of pumping except the final step may be continued for a longer period of time if desired by the owner. The pump is operated continuously for the entire period of the test. The discharge must be controlled with a gate valve, if electric driven, or a gate valve and throttle if engine driven. The discharge is controlled and maintained at approximately the desired discharge for each step with an accuracy of + 5 percent. Pump discharge is measured with a meter such as a circular orifice meter that will permit instantaneous determination of the discharge rate. A half-inch I.D. or larger pipe is installed from a point about 2 feet above the pump intake to the well head. The top of the pipe is readily accessible to insert remove and read the depth to water using either a steel tape or 2-wire electric sonde. Measurements of pumping rate and water level are made for each step of the test according to the schedule given in the constant discharge method. Recovery water-level measurements are made with the same frequency until the well has fully recovered or until sufficient data have been recovered to extrapolate full recovery. The test pump shall be capable of pumping 150 percent of the desired yield of the well.
- f. The pumping equipment shall be capable of operating continuously without interruption for the maximum period contemplated for the test.
- g. Data shall be provided to the Division on the forms furnished by the Division.

5.3.4.6 WELL DISINFECTION

- a. The well must be disinfected prior to the pumping test by the introduction of a chlorine solution into the well under sufficient pressure to overcome the natural flow pressures of all developed water-bearing zones, and in sufficient quantity to produce a minimum chlorine residual of fifty (50) parts per million (mg/L) in six (6) hours after such application.
- b. Table to determine chlorine compound necessary to dose 100 feet of water-filled well at 50 mg/L:

Well-Hole or	Volume	Amount of Chemical Compound		
Well-Casing	Per 100 ft	Calcium	Sodium	Liquid Chlorine
Diameter	Of Water Depth	Hypochlorite	Hypochlorite	(100% avail. Cl ₂)
(in inches)	(in gallons)	(65% avail. Cl ₂)	(12 trade %)	(in pounds)
4	65.28	0.7 oz	3.5 fl oz	0.03
6	146.9	1.5 oz	7.8 fl oz	0.06
8	261.1	2.7 oz	13.9 fl oz	0.11
10	408.0	4.2 oz	1.4 pt	0.17
12	587.5	6.0 oz	2.0 pt	0.25
16	1044.0	10.7 oz	3.5 pt	0.44
20	1632.0	1 lb 1 oz	0.7 gal	0.68
24	2350.0	1 lb 8 oz	1.0 gal	0.98
30	3672.0	2 lb 6 oz	1.5 gal	1.53

- c. After disinfection, the well must be pumped until no trace of chlorine remains in the water, nor in the water samples taken for microbiological analysis. If the water samples submitted are found to be unsatisfactory, the disinfection procedure must be repeated.
- d. The permanent pump and pumping equipment shall be disinfected with a chlorine solution prior to being placed into service.

5.3.4.7 WELL APPURTENANCES

- a. A concrete slab with a minimum thickness of six (6) inches shall be constructed around the well casing and shall extend at least two (2) feet in all directions, sloping away from the casing.
- b. The well casing shall extend at least twelve (12) inches above the concrete slab of the floor.
- c. When a submersible pump is used, the top of the casing shall be effectively sealed against the entrance of water under all conditions of vibration or movement of conductors or cables.
- d. For submersible pump installations, the well casing shall be provided with a sealed cover plate and, vented by a screened riser pipe so that the screened opening terminates downward at least twelve (12) inches above the top of the casing or ground level.
- e. For turbine pump installations, a concrete block to support the pump motor shall be constructed around the outer well casing, shall extend at least twelve (12) inches above the concrete slab, and:
 - 1. the outer casing shall extend at least one (1) inch above the pump motor block;

- 2. the well head and pump base shall be sealed to prevent seepage and the casing shall be vented by a screened riser pipe so that the screen opening terminates downward and above any point of back flow of contaminants into the well; and,
- 3. oil lubricated vertical turbine pumps shall be lubricated with an acceptable turbine oil as prescribed by the pump manufacturer.

5.3.4.7.1 DISCHARGE PIPING SHALL:

- a. be designed to keep friction losses at minimum;
- b. be equipped with a check valve, a shutoff valve, a pressure gauge and a means of measuring flow (water meter);
- c. be provided with a raw water sampling tap prior to the well discharge pipe check valve;
- d. where applicable, be equipped with an air release-vacuum relief valve located upstream from the check valve, with exhaust/relief piping terminating in a down-turned position at least 18 inches above the floor and covered with a 24 mesh corrosion resistant screen;
- e. have an access port of not less than five-eighths (5/8) inch in diameter, with screw cap, for water level measurements; a deep well air line and gage may also be used in conjunction with the access port;
- f. where pneumatic water level measuring equipment is used, it shall be manufactured using corrosion resistant materials attached firmly to the drop pipe or pump column and in such a manner as to prevent the entrance of foreign materials;
- g. have all chemical injection ports located down stream from the well discharge pipe check valve;
- h. have control valves and appurtenances located above the pumphouse floor;
- i. have all exposed piping, valves and appurtenances protected against physical damage or freezing;
- j. be properly anchored to prevent movement;
- k. be protected against surge or water hammer;
- 1. be valved or have means of pumping to waste (a blow-off), but shall not be directly connected to a sewer.

5.4.0 SPRINGS

- a. Springs must be protected by an enclosed structure. The walls of the structure must extend down to bedrock, or into the soil sufficiently to provide for a proper foundation to prevent surface water infiltration.
- b. All surface water run-off must be diverted from the spring.
- c. The spring must be protected from any entry of surface water.
- d. The overflow from the spring's enclosed structure must be designed to prevent entrance of contaminants or animals.
- e. A chlorine contact time of at least 30 minutes shall be provided.
- f. Continuous turbidity monitoring shall be provided with an automatic cutoff at 1.0 NTU.
- g. The pumping and water treatment facilities must be enclosed in shelters that are of weather and vandal-proof construction.
- h. The spring area must be secured to prevent unauthorized entry.

PART 6 - DESIGN CAPACITIES and WATER DEMANDS

6.1.1 <u>GENERAL</u> – An important factor in the planning and design of a water system is an accurate estimate of the quantities of water which must be supplied to meet water needs. These estimates are pivotal to the entire design including the production of water, pumping, treatment, storage, and the distribution system. Each water system component is designed to meet certain flow requirements and to insure that water will be available at the various water use points throughout the system in adequate quantities to meet demands.

6.1.2 ESTIMATING BASIC WATER DEMANDS

- a. The various components of a water system are designed to meet specific water flow criteria which are dependent upon the type of water system and the objectives of the system.
- b. <u>Average Daily Demand</u> expresses the quantity of water used in a system in an average day. It is based upon experience from water meter readings in similar water systems over an extended period of time and reflects the normal seasonal and daily variations. For design purposes, it is usually determined by estimating the population or units of housing or other units and multiplying by an average per person or per unit water consumption derived from past experience. The average daily demand will be exceeded on many days (during peak demands), so it is not appropriate to design merely for the average. The greatest amount of water usage in one day or other period of time must be considered.

The following provides a guide for estimating the average daily demand for various types of establishments, in gallons per day per unit. The unit is persons per day unless otherwise indicated. The values are for normal water requirements and do not include special needs or unusual conditions. Additional allowances should be made for fire fighting, lawn watering, swimming pool, industrial or commercial process water and other special uses.

Type of Establishment	Average Daily Use
(The unit is per person unless otherwise stated)	(gallons per day)
Airport (per passenger)	3-5
Assembly Halls (per seat)	2
Camps - Children, overnight, central facilities	40-50
- Construction	50
- Migrant Labor	35-50
- Day type, no meals served	15
Churches (per member)	1
Cottages, season occupancy	50
Clubs - Residential	100
- Non residential	25
Factories, sanitary uses, per shift	15-35

<u>Type of Establishment</u> (The unit is per person unless otherwise stated)	Average Daily Use (gallons per day)
Food Service – Restaurants - With bars	7-10 9-12
- Fast Food	2
Highway Rest Areas	5
Hotels (2 persons per room)	60
Institutions – Hospitals (per bed)	250-400
-Nursing Homes (per bed)	150-200
- Others	75-125
Office Buildings	15-30
Laundries, self service (per customer)	50
Motels (per bed)	60
Parks – Day use (with flush toilets)	5
- Mobile Homes (per unit)	200
- Travel trailers (per unit)	90-100
Picnic Areas (with flush toilets)	5-10
Residential Communities	
Single Family Dwelling (per person)	100
- Single Family Dwelling (per house maximum) 400
- Multi-family (per bedroom)	120
- Rooming house/tourist home (per bedroom)	120
Resort Motels and Hotels	75-100
Retail Stores (per toilet room)	400
Schools – Day, no showers or cafeteria	15
- Day, with cafeteria	20
- Day, with showers and cafeteria	25
- Residential types	75-100
Shopping centers, per sq. ft. sales area	0.16
Swimming Pools and Beaches	10
Theaters – Drive-in (per car)	3-5
- Others (per seat)	3

- c. <u>Maximum Daily Demand</u> expresses the greatest amount of water a system will use in one day. Small residential water systems may experience that their maximum day is 1.5 to 2 times the average day. However, this ratio may not apply to other types of water systems. In general, the smaller the water system, the greater the variation between the average and the maximum day.
- d. <u>Maximum Hourly Demand</u> expresses the greatest amount of water which will be used in any hour during the day. This is sometimes referred to as the peak hour demand, although there will be short term peak demand rates lasting for several minutes which will exceed the maximum hourly demand rate. Each type of system exhibits its own maximum hourly and short term peak demands and the hours of peak occurrence will vary. For example, shopping centers usually experience hourly peaks in the early afternoon while residential communities may experience two peak hours, about 8:00 a.m. and 6:00 p.m. The maximum hourly demand is often expressed as a ratio of the average daily demand, in gallons per

minute. Generally speaking, the smaller the water system, the greater the maximum hour rate in respect to the average daily rate. The peak hourly demand at small residential communities may range about 6 to over 10 times the average daily demand.

e. <u>Peak Demand</u> (instantaneous demand) is the maximum amount of water necessary to meet the peak short term demand rate which may occur several times during a day, usually occurring during the peak hour period. The instantaneous peak may last for several minutes. The rate is particularly important in considering the sizing of the storage tank in a hydropneumatic system. The effective storage capacity is usually designed to meet these short term peaks. The minimum effective storage volume of pressure tanks, in gallons, shall equal the peak demand, in gallons per minute (gpm), minus the pumping capacity (gpm), multiplied by 20. In the absence of sufficient effective storage to meet extended peak demands, the wells and pumps must be capable of meeting the peak demand. The smaller the water system, the greater the ratio of the peak demand to the average demand.

Number of Connections	Gallons Per Minute
10	40
15	50
20	58
25	66
30	73
35	80
40	85
45	91
50	96
55	101
60	106
70	115
80	124
90	132
100	140
125	160
150	175
175	195
200	205
250	230
300	255
400	295
500	335

INSTANTANEOUS (PEAK) DEMAND FOR RESIDENTIAL COMMUNITIES

Note: It should be noted that fire flow is not included in the definition of average daily and maximum daily demands and should be added if fire protection is desired. Fire flows are usually expressed as gallons per minute to fight a fire of a certain duration, and could be designed into a water system for fire fighting purposes. Local fire underwriters could provide specific requirements on request.

Number of Connections	Gallons Per Minute
10	25
15	31
20	37
25	42
30	46
35	50
40	54
45	57
50	60
55	64
60	66
70	72
80	78
90	84
100	88
125	100
150	110
200	128
250	145
300	160

INSTANTANEOUS (PEAK) DEMAND FOR MOBILE HOME PARK WATER SYSTEMS

INSTANTANEOUS (PEAK) DEMAND FOR CAMPGROUND & TRAVEL TRAILER WATER SYSTEMS

Number of Connections	Gallons Per Minute
20	25
25	32
40	38
50	43
60	47
80	55
100	60
120	69
140	73
160	80
180	85
200	90
300	110
400	130
600	163

PART 7 - DISTRIBUTION SYSTEMS

7.1.0 SYSTEM DESIGN

7.1.1. MINIMUM PIPE SIZE

- a. The water distribution system must be designed and the water lines sized to furnish at all times the instantaneous demand flow of water required under all conditions of flow.
- b. The minimum size of pipe for principal water mains and for water mains where fire hydrants are to be attached shall be 6-inch diameter.
- c. The minimum size water main shall be two (2) inches in nominal diameter. However, the size of water mains shall be justified by hydraulic analysis, performed by a professional engineer. The 2-inch water mains shall be considered for short cul-de-sacs and permanent dead-ends where future growth is not feasible.
- d. Generally, not more than 20, or the equivalent of 20, residences shall be connected to a 2-inch diameter water line, unless the main is looped or otherwise supplied from two connections with mains of adequate capacities. A looped 2-inch main shall serve no more than 40 residences, or the equivalent water demand of 40 residences. A 2-inch diameter main shall not exceed 1000 feet in length.
- e. All water mains, including those not designed to provide fire protection, shall be sized after a hydraulic analysis based on flow demands and pressure requirements has been completed.
- f. The system must be designed to maintain a minimum pressure of 20 psi at each service connection and at all points in distribution system under all conditions of flow. The normal working pressure in the distribution system should be approximately 60 psi and not less than 35 psi.
- g. Wide variations in pressure above the minimum requirement of 20 psi may be inherent in the design of a distribution system but pressures no greater than 100 psi should be delivered to the customer (unless higher pressures are requested.) The 100 psi maximum pressures can be met by pressure reducing valves in vicinity of each customer's source line, or by designing the distribution system to limit the maximum pressure.
- h. All assumptions and any flow data used must be clearly documented and submitted with the hydraulic analysis. If actual flow data is not available, theoretical calculations shall be based on all storage facilities half-full and the Hazen-Williams friction factor appropriate for type of pipe being used but in no

case greater than 130.

- i. Water mains and distribution systems should be sized to meet instantaneous peak demand flows. When fire protection is to be provided, system design should consider the recommendations of Insurance Underwriters organization.
- j. Fire hydrants shall meet the current AWWA Standard C502.

7.1.2 <u>DEAD ENDS</u>

- a. Dead ends shall be minimized by making appropriate tie-ins whenever practical.
- b. Where dead-end mains occur, they shall be provided with a fire hydrant, when fire flows are available, or with an acceptable flushing hydrant or blow-off for flushing purposes. The blow-off shall be at least 2 inches in diameter, but must be appropriately sized to provide flushing velocities of 2.5 feet per second or greater in the water main being flushed.
- c. No flushing device shall be directly connected to any sewer nor be subjected to flooding or plugging.

7.2.0 INSTALLATION OF MAINS

- a. Water lines must not be installed in contaminated areas such as sanitary landfill or dump areas.
- b. No water main or pipe shall pass through or come into contact with any part of a sewer or sewer manhole.
- c. A continuous and uniform bedding shall be provided in the trench for all buried pipe.
- d. Backfill material shall be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect pipe.
- e. Thrust restraint shall be provided at all points where hydraulic thrust may develop. This will include providing reaction blocking, tie rods or joints designed to prevent movement to all bends, tees, valves, plugs, hydrants and other points where thrust may develop.
- f. Whenever a state route or heavily traveled off-system road or a rail-road is crossed, the agency that has jurisdiction over the road or the rail-road must be notified, prior to the installation of the mains. At the crossing, a steel casing with sufficient diameter must be jacked and bored to accommodate the carrier pipe. Any free boring at low traffic city streets and county roads must conform to the applicable local and/or state requirements.

- g. Installation of water lines and appurtenances along highways, streets and roadways must comply with the applicable regulations of, and permits issued by, the Georgia Department of Transportation, local County and Municipality with reference to construction operations, safety, traffic control, road maintenance and repair.
- h. When non-metallic pipe is installed, detection tape or other acceptable means of detection shall be installed.
- i. Any pipe, solder or flux which is used in the installation or repair of the public water distribution system shall be lead free with not more than 8.0% lead in pipes and fittings and not more than 0.2% lead in solders and flux.
- j. Following installation, all new and repaired water lines and appurtenances shall be flushed, pressure tested and disinfected. Samples shall be collected and tested for satisfactory microbiological quality of the water, prior to placing the lines into service.

7.2.1 <u>ROCK EXCAVATION</u> - Stones found in the trench shall be removed for a depth of at least six (6) inches below the bottom of the pipe.

7.2.2 <u>COVER</u> – All distribution mains shall be provided with sufficient earth and other suitable cover to prevent freezing. This shall be not less than 24 inches measured above the top of pipe.

7.2.3 <u>HYDROSTATIC TESTS</u>

- a. Pressure and leakage tests shall be performed in accordance with the latest edition of AWWA Standard C600.
- b. The test pressure of the installed pipe shall be a minimum 1.5 times the working pressure, but not less than 150 psi, whichever is greater.
- c. Allowable leakage shall be no greater than as calculated in L=SD $(P)^{1/2}/133,200$ where L is allowable leakage in gallons/hour, S is the length of pipe tested in feet, D is pipe diameter in inches and P is test pressure during the leakage test in pounds per square inch (psi).

7.2.4 **DISINFECTION OF WATER MAINS**

- a. All new water mains, as well as those taken out of service for inspection, repair or other activities that might lead to contamination of water shall be disinfected before they are placed in or returned to service.
- b. Disinfection of the new mains and the disposal of the heavily chlorinated water,

following the disinfection, shall be accomplished in accordance with the latest edition of AWWA Standard C651.

- c. The "tablet method" of disinfection which consists of placing calcium hypochlorite granules or tablets in the water main as it is being installed and then filling the main with potable water when installation is complete is not allowed.
- d. Before the main is chlorinated, it shall be filled to eliminate air pockets and shall be flushed to remove particulates. A flushing velocity of not less than 2.5 feet/second is usually maintained in pipe sizes less than 24 inches in diameter. For larger diameter mains, an alternative to flushing, such as broom-sweeping of the main, is acceptable prior to chlorinating the main.
- e. During disinfection of the water mains, an appropriate cross-connection control device, consistent with the degree of hazard, shall be provided for backflow protection of the active distribution system.
- f. The quality of the water used during the disinfection procedures shall meet the required drinking water standards.
- g. The chlorine solution used for disinfection of water mains shall have a free chlorine residual concentration not less than 25 mg/L. This heavily chlorinated water shall be retained in the main for at least 24 hours, during which time all valves and hydrants shall be operated to ensure disinfection of the appurtenances. At the end of the 24-hour period, the treated water in all portions of the main shall have a residual of not less than 10 mg/L free chlorine. Re-chlorinate if required results are not obtained on all samples.
- h. After the applicable retention period, the heavily chlorinated water must not be disposed in a manner that will harm the environment. Neutralizing chemicals, such as Sulfur Dioxide, Sodium Bisulfite, Sodium Sulfite or Sodium Thiosulfate can be used to neutralize the chlorine residual remaining in the water to be wasted.
- i. Flush all lines until residual is equal to existing system. After final flushing and before the water main is placed into service, water samples shall be collected from the main and tested for microbiological quality in accordance with the Georgia Rules for Safe Drinking Water, Chapter 391-3-5. The laboratory results must show the absence of colliform organisms in the water. Reflush and redisinfect the lines, as necessary, until satisfactory bacteriological results are obtained.

7.2.4.1 <u>DISINFECTION WHEN CUTTING INTO OR REPAIRING EXISTING MAINS</u>

- a. Shall be performed when mains are wholly or partially dewatered;
- b. Shall follow the current AWWA C651 Standards, including trench treatment, swabbing with hypochlorite solution, flushing and/or slug chlorination as

appropriate;

- c. Bacteriological testing shall be performed after the repairs are complete. However, depending upon the circumstances, the water main may be returned to service prior to completion of testing to minimize the time the customers are out of service.
- d. Leaks or breaks that are repaired with clamping devices while the mains remain full of water under pressure may require no disinfection.

7.2.4.2 AMOUNT OF CHLORINE NECESSARY FOR DISINFECTION

a. Chlorine required to produce 25 mg/L concentration in 100 feet of pipe by diameter:

Pipe Diameter	100% Chlorine		1% Chlorine Solution	
(inches)	(lbs)	(g)	(gal)	(L)
4	0.013	5.9	0.16	0.6
6	0.030	13.6	0.36	1.4
8	0.054	24.5	0.65	2.5
10	0.085	38.6	1.02	3.9
12	0.120	54.4	1.44	5.4
16	0.217	98.4	2.60	9.8

Note: 1% chlorine solution may be prepared with sodium hypochlorite (contains 5% to 15% available chlorine) or calcium hypochlorite (contains approximately 65% available chlorine by weight). To prepare 1% chlorine solution using calcium hypochlorite, add one (1) pound (454 grams) of calcium hypochlorite in approximately 8 gallons of water.

b. Amounts and types of chemicals advised to be used for neutralizing various residual chlorine concentration in 100,000 gallons of water

Residual	Chemicals							
Chlorine	Sulfur		Sodium		Sodium		Sodium	
Concentration	Dioxide		Bisulfate		Sulfite		Thiosulfate	
	(SO_2)		(NaHSO ₃)		(Na_2SO_3)		$(Na_2S_2O_3.5H_2O)$	
Mg/L	lb	Kg	lb	Kg	lb	Kg	lb	Kg
1	0.8	0.36	1.2	0.54	1.4	0.64	1.2	0.54
2	1.7	0.77	2.5	1.13	2.9	1.32	2.4	1.09
10	8.3	3.76	12.5	5.67	14.6	6.62	12.0	5.44
50	41.7	18.91	62.6	28.39	73.0	33.11	60.0	27.22

7.2.5 SEPARATION OF WATER MAINS AND SEWERS

7.2.5.1 <u>GENERAL</u> - The following factors should be considered in providing adequate separation:

- a. materials and type of joints for water and sewer pipes;
- b. soil conditions;
- c. service and branch connections into the water main and sewer line;
- d. compensating variations in the horizontal and vertical separations;
- e. space for repair and alterations of water and sewer pipes;
- f. off-setting of pipes around manholes;
- g. water mains and sanitary or storm sewers shall not be laid in the same trench.

7.2.5.2 PARALLEL INSTALLATION

- a. Water mains shall be laid at least ten (10) feet horizontally from any existing or proposed sanitary sewer, storm sewer or sewer manhole. The distance shall be measured edge-to-edge.
- b. When local conditions prevent a horizontal separation of 10 feet, the water main may be laid closer to a sewer (on a case-by-case basis) provided the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer. It is advised that the sewer be constructed of materials and with joints that are equivalent to water main standards of construction and be pressure tested to assure water-tightness prior to backfilling.

7.2.5.3 <u>CROSSINGS</u>

a. Water mains crossing house sewers, storm sewers or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer. At the crossings, one full length of water pipe shall be located so that both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required.

- b. When local conditions prevent a vertical separation of 18 inches, the sewer passing over or under water mains shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to assure water-tightness prior to backfilling.
- c. When water mains cross under sewers, additional measures shall be taken by providing:
 - 1. a vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main;
 - 2. adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking the water mains;
 - 3. that the length of water pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer; and,
 - 4. both the sewer and the water main shall be constructed of water pipe materials and subjected to hydrostatic tests, as prescribed in this document. Encasement of the water pipe in concrete shall also be considered.

7.3.0 SURFACE WATER CROSSINGS

7.3.1 <u>GENERAL</u>: Surface water crossings, both over and under water, may present special concerns and should be discussed with the Division before the final plans are prepared.

- a. At above water crossings, the pipe shall be adequately supported and anchored, protected from damage and freezing, and accessible for repairs or replacement.
- b. At underwater crossings, a minimum of two (2) feet of cover shall be provided over the pipe.
- c. The installation of ductile iron pipe with restrained push-on joints and encased in concrete, may be considered with the prior approval of the Division. Otherwise, when crossing water courses which are greater than 15 feet in width, only pipes of special construction, having flexible, watertight joints shall be installed.
- d. Valves shall be provided at both ends of water crossings so that the section can be isolated for testing or repair (valves shall be easily accessible and not subject to flooding); the valve closest to the supply source shall be in a manhole;

e. Sampling taps shall be installed at each end of the crossing, and permanent taps shall be made for testing and determining leaks.

7.4.0 <u>CROSS CONNECTIONS</u>

7.4.1 <u>GENERAL</u> - There shall be no physical connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water and other contaminating materials may be discharged or drawn into the system.

- a. The approval of the Division shall be obtained for interconnections between potable water supplies.
- b. Neither steam condensate nor cooling water from engine jackets or other heat exchange devices shall be returned to the potable water supply.

7.5.0 WATER SERVICES AND PLUMBING

- a. Water services and plumbing should conform to relevant local and/or state plumbing codes, or to the Standard Plumbing Code, as applicable within the jurisdiction in which the system is located.
- b. The product that is used for the service line must be listed as being certified for conformance with the NSF Standard 61.
- c. All new services connected to community and nontransient noncommunity water systems shall be metered.
- d. Any pipe, solder or flux used in the installation or repair shall be lead free with not more than 8.0% lead in pipes and fittings, and not more than 0.2% lead in solders or flux.

7.6.0 <u>MATERIALS</u>

7.6.1 <u>GENERAL</u>

- a. All materials that come into contact with the drinking water during its treatment, storage, transmission or distribution shall not adversely affect drinking water quality and public health and must be certified for conformance with American National Standards Institute/ National Sanitation Foundation Standard 61 (ANSI/NSF Standard 61).
- b. The pipe, fittings, valves and fire hydrants selected shall conform with the latest AWWA Standards. In the absence of such standards, pipe meeting applicable ASTM and ANSI criteria and acceptable to the Division may be selected.

- c. Special attention shall be given to selecting pipe materials which will protect against both internal and external corrosion.
- d. Used water mains that meet these standards may be used again after the pipe has been thoroughly cleaned and restored practically to its original condition.
- e. Pipes and pipe fittings containing more than 8% lead shall not be used.
- f. Pipe having mechanical joints or slip-on joints with rubber gaskets shall be used. Lead-tip gaskets shall not be used.
- g. In general, packing and jointing materials used must meet the latest edition of the AWWA Standards. Joints shall conform to AWWA Standard C111.
- h. Ductile iron and cast iron pipe shall meet the latest edition of ANSI/AWWA Standard C106 or C108 for cast iron pipe and C151 for ductile iron pipe.
- i. Pipe and fittings shall be cement lined in accordance with the latest edition of AWWA Standard C104.
- j. Fittings shall be ductile iron and shall conform to the latest edition of AWWA Standard C110 or C153.
- k. Concrete pipe shall meet the latest edition of AWWA Standard C300.

7.6.2 <u>PVC PIPE (2 inch through 12 inch)</u>

- a. PVC pipe meeting the standards set forth in AWWA C-900 (latest edition) shall be acceptable for those working pressures as designated by class. (Note that C-900 refers only to 4-inch through 12-inch pipe)
- b. The pipe shall meet all the requirements set forth in ASTM Standard D 2241. The pipe must bear the seal of approval for potable water use and for conformance with NSF Standard 61.
- c. Provisions must be made for contraction and expansion at each joint with flexible ring gaskets made from rubber or other suitable material. Gasket materials shall meet the requirements established in ASTM F477.
- d. All fittings such as tees, ells, etc. using welded joints shall be factory welded and shall meet the same specifications as the welded bell section.

- e. Lubricants shall be non-toxic, shall not promote biological growth, and shall be certified for conformance with NSF Standard 61.
- f. Solvent cemented joints are not allowed for buried pipes.
- g. Detection tape shall be placed along all PVC water mains.

7.6.3 <u>OTHERS</u> - Any pipe material which is not specifically stated in this section shall be considered on an individual basis.

7.6.4 VALVE, AIR RELIEF, METER AND BLOW-OFF CHAMBERS

- a. Sediment accumulations may be removed through a standard fire hydrant. In addition, compressed air and pumping may be used for dewatering mains through hydrants.
- b. At high points in water mains where air can accumulate, provisions shall be made to remove the air by means of hydrants or air relief valves. Automatic air relief valves shall not be used in areas where flooding of the manhole or chamber may occur.
- c. The open end of an air relief pipe from automatic valves shall be extended to at least one (1) foot above grade and provided with a screened, downward-facing elbow. The pipe from a manually operated valve should be extended to the top of the pit.
- d. Chambers of pits containing valves, blow-offs, meters or other such appurtenances to a distribution system, shall not be connected directly to any storm drain or sanitary sewer, nor shall blow-offs or air-relief valves be connected directly to any sewer.
- e. Such chambers or pits shall be drained to the surface of the ground where they are not subject to flooding by surface water, or to absorption pits underground.
- f. Valves are to be placed at all intersections of water mains. Valves should be located at not more than 500 foot intervals in commercial districts and at not more than one block or 800 foot intervals in other districts. Where systems serve widely scattered customers, the valve spacing should not exceed 4000 feet.
- g. Valves shall meet the current AWWA Standards.

PART 8 - FINISHED WATER STORAGE

8.1.0 <u>GENERAL</u> - The materials and designs used for finished water storage structures shall provide stability and durability, as well as protect the quality of the stored water. Steel structures shall follow the current American Water Works Association standards concerning steel tanks, standpipes, reservoirs, and elevated tanks wherever they are applicable. Other materials of construction may be acceptable when properly designed to meet the requirements of this part.

8.1.1 LOCATION

- a. The bottom of ground-level reservoirs should be placed at the normal ground surface and above maximum flood level.
- b. Where the bottom must be below normal ground surface, it should be placed above the ground water table.
- c. Sewers, drains, standing water, and similar sources of contamination must be kept at least 50 feet from the reservoir. Mechanical-joint water pipe, pressure tested in place to 50 psi without leakage may be used for gravity sewers at lesser separations.
- d. The top of a ground-level reservoir should not be less than 2 feet above normal ground surface and any possible flood level. Clearwells constructed under filters may be exempted from this requirement when the total design gives the same protection.

8.1.2 **PROTECTION**

- a. All new finished water storage structures shall have suitable watertight roofs or covers which exclude birds, animals, insects, and excessive dust.
- b. Protection from Trespassers: Fencing, locks on access manholes, and other necessary precautions shall be provided to prevent trespassing, vandalism and sabotage.
- 8.1.3 <u>DRAINS</u> No drain on a water storage structure may have a direct connection to a sewer or storm drain. Splash pad and drainage channel shall be provided to prevent erosion. The outlet of the drain shall be provided with a twenty-four mesh non-corrodible screen or a flap valve.

8.1.4 OVERFLOW

- a. The overflow pipe of a water storage structure shall be brought down near the ground surface and discharged over a drainage inlet structure or a splash plate and flow onto a drainage ditch which is rip-rapped or otherwise protected to minimize erosion.
- b. No overflow shall be connected directly to a sewer or storm drain or be not visible to sight.
- c. When an internal overflow pipe is used, it shall be located in the access tube.
- d. The overflow of a ground-level structure shall be high enough above normal or graded ground surface to prevent the entrance of surface water.
- e. The overflow shall be protected with a twenty-four mesh non-corrodible screen and/or a flap valve.
- f. The outlet of the overflow shall always be visible.

8.1.5 <u>ACCESS</u>

- a. Finished water storage structures shall be designed with reasonably convenient access to the interior for cleaning and maintenance.
- b. Manholes on scuttles above waterline:
 - 1. shall be framed at least 4 inches, and preferably 6 inches, above the surface of the roof at the opening. On ground-level structures, manholes should be elevated 24 to 36 inches above the top or covering sod;
 - 2. shall be fitted with a solid watertight cover which overlaps the framed opening and extends down around the frame at least 2 inches;
 - 3. should be hinged at one side;
 - 4. shall have a locking device; and,
 - 5. shall be a minimum of 20 inches in diameter or equivalent.

8.1.6 <u>VENTS</u>

- a. Finished water storage structures shall be vented by separate special vent structures.
- b. Overflow pipe or any other opening constructed between the side wall and the

roof is not permissible to be used as vents.

- c. The vents:
 - 1. shall prevent the entrance of surface water;
 - 2. shall exclude birds and animals;
 - 3. shall exclude insects and dust, as much as this function can be made compatible with effective venting. For elevated tanks and standpipes, 4 mesh non-corrodible screen may be used;
 - 4. shall, on ground-level structures, terminate in an inverted U construction, the opening of which is 24 to 36 inches above the roof of sod and is covered with 24-mesh non-corrodible screen.

8.1.7 <u>ROOF AND SIDEWALL</u> - The roof and sidewalls of all structures must be watertight with no openings except properly constructed vents, manholes, overflows, risers, drains, pump mountings, control ports or piping for inflow and outflow.

- a. any pipe running through the roof or sidewall of a finished water storage structure must be welded or properly gasketed in metal tanks, or should be connected to standard wall castings which were poured in place during the forming of a concrete structure; these wall castings should have flanges embedded in the concrete.
- b. openings in a storage structure roof or top, designed to accommodate control apparatus or pump columns, shall be curbed and sleeved with proper additional shielding to prevent the access of surface or slope water to the structure.
- c. valves and controls should be located outside the storage structure so that valve stems and similar projections will not pass through the roof or top of the reservoir.

8.1.8 <u>DRAINAGE FOR ROOF OR COVER</u> - The roof or cover of the storage structure should be well drained, but downspout pipes shall not enter or pass through the reservoir, parapets or similar construction which would tend to hold water and snow on the roof will not be approved.

8.1.9 <u>SAFETY</u> - The safety of employees must be considered in the design of the storage structure. As a minimum, such matters shall conform to pertinent laws and regulations.

- a. ladders, ladder guards, balcony railings, and safe location of entrance hatches shall be provided where applicable;
- b. elevated tanks with riser pipes over 8 inches in diameter shall have protective bars over the riser openings inside the tank.

8.1.10 <u>FREEZING</u> - All finished water storage structures and their appurtenances, especially the riser pipes, overflows and vents, shall be designed to prevent freezing which will interfere with proper functioning.

8.1.11 <u>GRADING</u> - The area surrounding a ground-level structure shall be graded in a manner that will prevent surface water from standing within 50 feet of the structure.

8.1.12 <u>SILT STOP</u> - The discharge pipe of the reservoir shall be located in a manner that will prevent the flow of sediment into the distribution system. Either a permanent or removable silt stop shall be provided at least 4 inches above the bottom of the storage structure.

8.1.13 <u>PAINTING AND/OR CATHODIC PROTECTION</u> - Proper protection should be given to metal surfaces by paints or other protective coatings, by cathodic protective devices or by both.

- a. Paint systems shall be consistent with the current American Water Works Association standards and all paint coatings must be certified for conformance with NSF Standard 61 for contact with potable water.
- b. Cathodic protection should be designed and installed by competent technical personnel.

8.1.14 <u>TURNOVER OF WATER</u> – If the storage reservoir is sized larger than required for initial demand and there is more than 2 days storage, provisions shall be made for tumover of the water in the tank and/or booster chlorination.

8.1.15 <u>SAMPLING</u> - A suitable sampling tap should be provided on all storage structures and be protected from public access.

8.1.16 <u>ADJACENT COMPARTMENTS</u> - Finished water must not be stored or conveyed in a compartment adjacent to unsafe water when the two compartments are separated by a single wall.

8.1.17 <u>BASINS AND WET-WELLS</u> - Receiving basins and pump wet-wells for finished water shall be designed as finished water storage structures.

8.2.0 **DISINFECTION OF STORAGE TANKS**

a. Finished water storage structures shall be disinfected in accordance with the latest edition of AWWA Standard C652 before being placed into or restored to service.

- b. The forms of chlorine that may be used during disinfection are high-test calcium hypochlorite, sodium hypochlorite solution or liquid chlorine.
- c. Only potable water shall be used as the water supply during the disinfecting operations.
- d. One of the three following methods of disinfection shall be used:
 - 1. <u>First Method</u>: After the storage tank has been thoroughly dried, it shall be filled slowly to the overflow level with potable water to which enough chlorine is added to provide a free chlorine residual in the full facility of not less than 10 mg/L at the end of the 24-hour period. After the 24-hour retention period, the highly chlorinated water in the storage tank shall be completely emptied (by applying a reducing agent to the wasted water to thoroughly neutralize the chlorine residual in the water), and then refilled with potable water. After refilling, samples of water shall be taken from the storage tank and tested to demonstrate that the water in the tank is microbiologically satisfactory in accordance with the Georgia Rules for Safe Drinking Water, Chapter 391-3-5, before the tank is placed in or restored to regular service.
 - 2. Second Method: The walls and bottoms of storage tanks shall be thoroughly cleaned to remove all dirt and loose material. A strong chlorine solution (at least 200 mg/L) shall be applied to the surface of all parts of the storage facility, including the inlet and outlet piping, that would be in contact with water when the storage facility is full to the overflow elevation. The disinfected surfaces shall remain in contact with the strong chlorine solution for at least 30 minutes, after which potable water shall be admitted. After that, the highly chlorinated water in the tank shall be disposed in an acceptable manner, as stated above, and then refilled with potable water to its overflow level. After refilling, samples of water shall be taken from the storage tank and tested to demonstrate that the water in the tank is microbiologically satisfactory in accordance with the Georgia Rules for Safe Drinking Water, Chapter 391-3-5, before the tank is placed in or restored to regular service.
 - 3. <u>Third Method</u>: Water containing a minimum of 50 mg/L chlorine shall be placed in the storage tank to such depth that, when the storage tank is filled with potable water to the overflow level and held full for a period of at least 24 hours, there will be a free chlorine residual of not be less than 2 mg/L. The full storage tank must be allowed to stand for 24 hours. All highly chlorinated water shall then be purged from the drain piping. Samples of water shall be taken from the storage tank and tested to demonstrate that the water in the tank is microbiologically satisfactory in accordance with the Georgia Rules for Safe Drinking Water, Chapter 391-3-5. The storage tank may be put into service without draining the remaining water in the tank.

8.3.0 OTHER STORAGE TANKS

8.3.1 <u>PLANT STORAGE</u> - The applicable design standards of this document shall be followed for the plant storage.

8.3.2 <u>WASHWATER TANKS</u> - If washwater tanks are used, they shall be sized in conjunction with available pump units and finished water storage to furnish the back wash water required. In the design, consideration must be given to the possibility of having to wash more than one filter at a time or several filters in succession.

8.3.3 <u>CLEARWELL</u> - Clearwell storage should be sized in conjunction with distribution system storage to relieve the filters from having to follow fluctuations in water use to meet peak demands, including filter backwash water.

- a. The design shall include features (i.e. baffles) to minimize short circuiting.
- b. It shall be sized to provide the required contact time for chlorine (CT), to achieve required level of inactivation of *Giardia* cysts and viruses (or any other pathogen that may be required under the current Surface Water Treatment Rules) through disinfection under worst case conditions.
- c. A drain and an overflow shall be provided for the clearwell.
- d. It shall be vented.

8.3.4 <u>PRESSURE TANKS</u> - Hydropneumatic (pressure) storage tanks should be located above normal ground surface and either be completely housed or one end be projected into an operating house to prevent freezing of the control units.

8.3.4.1 <u>Bypass</u> - Tanks should have bypass piping to permit operation of the system while the tank is being repaired or painted.

8.3.4.2 <u>Paint systems</u> shall be consistent with the current American Water Works Association Standards and all paint coatings must be certified for conformance with NSF Standard 61 for contact with potable water.

8.3.4.3 <u>Disinfection</u> - Finished water storage structures shall be disinfected in accordance with the latest edition of AWWA Standard C652 before being placed into service.

8.3.4.4 <u>Sampling</u> - A suitable sampling tap should be provided on all storage structures and be protected from public access.

8.3.4.5 <u>Protection from Trespassers</u> – Fencing and other necessary precautions shall be provided to prevent unauthorized entry, vandalism, and sabotage.

8.3.4.6 <u>Appurtenances</u> - Each tank should have an access manhole, cutoff valves, a drain, a control equipment consisting of pressure gage, water sight glass, automatic or manual air blow-off, mechanical means for adding air, and pressure-operated start-stop controls for the pumps.

8.3.4.7 <u>Sizing</u> - The hydropneumatic tanks must be properly sized to supply the required peak demand for a period of at least twenty (20) minutes. In the design, it is assumed that a combination of hydropneumatic storage and pumping will be utilized. The Effective Volume of the tank is considered to be the volume of water discharged between the high and low pressure settings.

Required Effective Volume (gal) = [Peak Demand (gpm) - Pumping Capacity (gpm)] x 20 minutes

For example, a mobile home system that serves 50 spaces will require an instantaneous (peak) demand flow of 60 gpm (see the tables provided in this document). If this system has a well with a pumping capacity of 30 gpm, then the required effective volume for the system is 600 gallons:

Required Effective Volume = (Peak Demand - Pumping Capacity) x 20 Minutes

= $(60 \text{ gpm} - 30 \text{ gpm}) \times 20 \text{ minutes}$

= 600 gallons

The actual size of the pressure storage tank necessary to furnish the 600 gallons effective volume depends upon the pressure settings, air-water volume controls, etc. A system without an air-water control system would require the largest tank, whereas a system with an air charging device and automatic air-water volume controls would require a much smaller tank. As indicated above, all pressure storage tanks must be equipped with mechanical means for adding air, and pressure-operated start-stop controls for the pumps. In general, it is assumed that a properly designed pressure tank with an air charging system with automatic air-water volume controls, would be able to discharge up to 25 % of the tank volume during a typical 60-40 psi pressure cycle. Then the total tank volume necessary to furnish the required effective volume in this case would be:

Total Tank Volume (gallons) = $\frac{\text{Required Effective Volume (gallons)}}{25\%}$

$$= \frac{600 \text{ gallons}}{0.25}$$

= 2,400 gallons

8.3.4.8 <u>Auxiliary power</u> – It is highly recommended that an auxiliary power with an automatic takeover capability be provided when positive pressures are not available from system gravity flow.

- 8.3.5 <u>DISTRIBUTION STORAGE</u> The applicable design standards of this document shall be followed for distribution storage.
 - a. The purpose of system storage is to have sufficient water available to provide adequate flow and pressure at peak demand as well as to provide for fire flows when needed. For most water systems a satisfactory rule-of-thumb to meet these needs is to provide at least the average 24-hour demand in elevated storage. An engineering study should be performed to determine the system's actual elevated storage capacity needs.
 - b. <u>Pressure Variation</u> System pressure variation on account of changes in level of water in storage structures should be minimized. Elevated storage tanks or large diameter ground tanks located on high ground should be the usual choices. Normally, standpipes should not be considered for distribution storages, unless completely justified.
 - c. <u>Drainage</u> Storage structures which float on the distribution system should be designed to drain for cleaning or maintenance without necessitating loss of pressure in the distribution system. The drains should discharge to the ground surface with no direct connection to a sewer or storm drain. A nearby fire hydrant may be considered as a drain as long as service is not interrupted and suitable erosion protection is provided.
 - d. <u>Level Controls</u> Adequate controls shall be provided to maintain levels in distribution system storage structures.
 - 1. Telemeter equipment should be used when pressure-type controls are employed and any appreciable head loss occurs in the distribution system between the source and the storage structure.
 - 2. Altitude valves or equivalent controls may be required for a second and subsequent structures on the system.
 - 3. Overflow and low-level warnings or alarms should be located at places in the community where they could be under responsible surveillance on a 24 hour basis.

PART 9 - PUMPING FACILITIES

9.1.0 <u>GENERAL</u>

- a. Pumping facilities shall be designed to maintain the sanitary quality of pumped water.
- b. Subsurface pits or pump rooms and inaccessible installations should be avoided.
- c. No pumping station shall be subject to flooding.

9.1.1 <u>LOCATION</u> - The pumping station shall be so located that the proposed site will meet the requirements of the sanitary protection of the water quality, hydraulics of the system and be protected against interruption of service by fire, flood or any other hazard.

- a. The station shall be:
 - 1. elevated to a minimum of one foot above highest recorded flood elevation, or protected to such elevation;
 - 2. accessible at all times unless permitted to be out of service for period of inaccessibility;
 - 3. graded around station so as to divert surface drainage away from the station;
 - 4. protected to prevent vandalism and entrance by unauthorized persons or animals.

9.2.0 <u>GROUND WATER FACILITIES</u> - Where pumping facilities are used, wells and springs shall be vented by properly hooded and screened pipe extending at least 12 inches above the pump floor. Where necessary, provision shall be made for lubricating the pump from a point at least 6 inches above the top of the well cover by means which will prevent contamination of the water supply.

- 9.2.1 <u>DRILLED WELLS</u> Pumping stations located over drilled wells shall:
 - a. have riser pipe or casing ex-tending at least 12 inches above the floor and be equipped with flange or suitable stuffing box;
 - b. have riser pipe or casing firmly connected to the pump structure to provide a water tight connection;

- c. have base of pump not less than 6 inches above pump room floor;
- d. have pump foundation and base designed to prevent water from coming into contact with the joint.

9.2.1.1 <u>SUBMERSIBLE PUMPS</u> - Where a submersible pump is used, the top of the casing shall be effectively sealed against entrance of water under all conditions of vibration or movements of conductors or cables.

9.2.1.2 <u>DISCHARGE PIPING</u> - Discharge piping should be provided with means to pump to waste but shall not be directly connected to a sewer. The discharge line shall:

- a. have control valves located above pump floor;
- b. be protected against freezing;
- c. be valved to permit testing and control of each well;
- d. have watertight joints;
- e. have all exposed valves protected.

9.3.0 <u>SURFACE WATER FACILITIES</u> - Pump stations normally associated with surface water sources, either as raw or finished water pump stations shall:

- a. have adequate space for the installation of additional units if needed. and for the safe servicing of all equipment;
- b. be of durable character, fire and weather resistant and with outward opening doors;
- c. have floor elevation of at least 6 inches above finished grade;
- d. have underground structure waterproofed;
- e. have all floors drained without impairing the quality of water being handled and if equipment is contained on the floor, the floor shall have sufficient slope to drain adequately;
- f. provide suitable outlet for drainage from pump glands without discharging onto the floor.

9.3.1 <u>SUCTION WELL</u> - Suction wells shall:

- a. be watertight;
- b. have floors sloped to permit removal of water and entrained solids;
- c. be covered or otherwise protected against contamination, including pump lubricant.

9.3.2 <u>EQUIPMENT SERVICING</u> - Pump facilities shall be provided with:

- a. crane-ways, hoist beams, eye bolts or other adequate facilities for servicing or removal of pumps, meters or heavy equipment;
- b. openings in floors, roofs or wherever else needed for removal of heavy or bulky equipment;
- c. a convenient tool board or other facilities as needed for proper maintenance of the equipment.

9.3.3 <u>STAIRWAYS AND LADDERS</u> - Stairways or ladder shall:

- a. be provided between all floors in pits or compartments which must be entered;
- b. have handrails on both sides and treads of non-slip material.
- c. Stairs are preferred in areas where there is frequent traffic or where supplies are transported by hand. They shall have risers not exceeding 9 inches and treads wide enough for safety.
- 9.3.4 <u>HEATING</u> Provision shall be made for adequate heating for:
 - a. comfort of the operator;
 - b. the safe and efficient operation of the equipment;
 - c. In pump houses not occupied by personnel, only enough heat need be provided to prevent freezing of equipment or treatment process.

9.3.5 <u>VENTILATION</u> – Adequate ventilation shall be provided for all pumping stations. Forced ventilation of at least 6 changes of air per hour shall be provided for:

a. all rooms, compartments, pits and other enclosures below grade floor;

b. any area where unsafe atmosphere may develop or where excessive heat may be built up.

9.3.6 <u>DEHUMIDIFICATION</u> - In areas where excess moisture could cause hazards to safety or damage to equipment means for dehumidification shall be provided.

9.3.7 <u>LIGHTING</u> - Pump stations shall be adequately lighted throughout. All electrical work shall conform to the requirements of the related agencies and to relevant State and/or local codes.

9.3.8 <u>SANITARY AND OTHER CONVENIENCES</u> - Pumping stations which are manned for extended periods shall be provided with potable water, lavatory and toilet facilities. Plumbing must be so installed as to prevent contamination of a public water supply.

9.4.0 <u>PUMPS</u>

9.4.1 <u>GENERAL</u>

- a. At least 2 pumping units shall be provided. Each pumping unit shall be capable of carrying the peak demand. If more than 2 units are installed, they shall have sufficient capacity so that any one pump can be taken out of service and the remaining pumps are capable of carrying the peak demand.
- b. The pumping units shall:
 - 1. have ample capacity to supply the peak demand without dangerous overloading;
 - 2. be driven by a prime mover able to operate against the maximum head and air temperature which may be encountered;
 - 3. have spare parts and tools readily available.

9.4.2 <u>SUCTION LIFT</u> - Suction lift pumps shall be considered on an individual basis based on justification of the design engineer.

- 9.4.3 <u>BOOSTER PUMPS</u> Booster pumps shall be located or controlled so that:
 - a. they will not produce negative pressure anywhere in the distribution system.
 - b. the pressure in the suction line shall be maintained at or above 20 psi by

the use of a pressure sustaining valve or low pressure cutoff device.

c. automatic or remote control devices shall have a range between the start and cutoff pressure which will prevent excessive cycling.

9.4.4 <u>IN-LINE BOOSTER PUMPS</u> - In addition to the other requirements of this section, in-line booster pumps shall be accessible for servicing and repairs.

9.4.5 <u>FIRE PUMPS</u> - The criteria in this section also apply to fire pumps.

9.5.0 <u>AUTOMATIC AND REMOTE CONTROLLED STATIONS</u> - All automatic stations shall be provided with automatic signaling apparatus which will report when the station is out of service. All remote controlled stations shall be electrically operated and controlled and shall have signaling apparatus of proven performance. Installation of electrical equipment shall conform with the acceptable and applicable codes.

9.6.0 <u>APPURTENANCES</u>

9.6.1 <u>VALVES</u>

- a. Pumps shall be adequately valved to permit satisfactory operation, maintenance and repair of the equipment. If foot valves are necessary, they shall have a net valve area of at least 2 ¹/₂times the area of the suction pipe and they shall be screened.
- b. Each pump shall have a positive acting check valve on the discharge side between the pump and shutoff valve.
- 9.6.2 <u>PIPING</u> In general, piping shall:
 - a. be designed so that friction head will be minimized;
 - b. not be subject to contamination;
 - c. have watertight joints;
 - d. be protected against surge or water hammer;
 - e. be such that each pump has an individual suction line or the lines shall be so manifolded that they will insure hydraulic and operation conditions.

9.6.3 <u>GAUGES AND METERS</u> – Each pump shall:

- a. have a standard pressure gauge on its discharge line;
- b. have a compound gauge on its suction line;
- c. have recording gauges in larger stations;
- d. have a means for measuring the discharge;
- e. have sampling taps;
- f. Large stations should be equipped with totalizing and recording metering of the total water pumped.

9.6.4 <u>WATER SEALS</u> – Water seals shall not be supplied with water of a lesser sanitary quality than that of the water being pumped.

9.6.5 <u>CONTROLS</u> – Pumps, their prime movers and accessories, shall be controlled in such a manner that they will operate at rated capacity without dangerous overload. Where two or more pumps are installed, provision shall be made for proper alternation. Provision shall be made to prevent operation of the pump during the backspin cycle. Electrical controls shall be located above grade.

9.6.6 <u>POWER</u> – When power failure would result in cessation of minimum essential service, power supply shall be provided from at least two independent sources or standby or auxiliary source shall be provided or be available.

9.6.7 <u>AUXILIARY POWER SUPPLY</u> – When automatic pre-lubrication of pump bearings is necessary, and an auxiliary power supply is provided, then the pre-lubrication line shall be provided with a valved by-pass around the automatic control.

PART 10 - TREATMENT

10.1.0 GENERAL

- a. The design of treatment processes and devices depends on evaluation of the nature and quality of the particular water to be treated and the desired quality of the finished water. However, the constructed facilities and the quality of the finished water must consistently and reliably meet the applicable state and federal drinking water standards.
- b. All those water systems that are using surface water sources or ground waters determined to be under the direct influence of surface waters shall be designed and constructed to assure compliance of the finished water quality with the current state and federal regulations that are in effect concerning the treatment, removal, and inactivation of the applicable chemical, physical and biological contaminants.
- c. The quality of the raw water, the quality desired in the finished water and other factors may require installation of multiple-stage treatment facilities and/or presedimentation facilities.
- d. Water treatment plants processing surface water sources shall include, but not limited to, means for rapid mixing, flocculation, sedimentation, filtration and disinfection. They shall preferably be of conventional type design.
 - 1. Pressure filtration systems shall not be installed to treat surface water supply sources.
 - 2. The treatment plant shall be of such construction to allow units to be taken out of service without disrupting the operation and required treatment processes.
- e. At its discretion, the Division may accept new and alternate treatment means, methods and technologies, provided the following are demonstrated to the satisfaction of the Division:
 - 1. The treatment method has been thoroughly tested in full scale comparable installations by an acceptable third party, in accordance with protocol and standards acceptable to the Division; and
 - 2. Has been thoroughly tested in a plant approved by the Division, by an acceptable third party, in accordance with protocol and standards acceptable to the Division, and operated for a period that shall demonstrate the effectiveness and reliability of the proposed treatment system during changes in seasonal and climatic conditions.

10.2.0 <u>CLARIFICATION</u> – Plants designed for processing surface waters should:

- 1. provide a minimum of two units each for flocculation and sedimentation;
- 2. permit operation of the units either in series or parallel where softening is performed and should permit series or parallel operation where plain clarification is performed;
- 3. be constructed to permit units to be taken out of service without disrupting operation, and with drains or pumps sized to allow dewatering in a reasonable period of time;
- 4. provide multiple-stage treatment facilities when required by the Division;
- 5. be started manually following shutdown;
- 6. minimize hydraulic head losses between units to allow future changes in processes without the need for repumping.

10.2.1 <u>PRESEDIMENTATION</u> - Waters containing high turbidity may require pretreatment, usually sedimentation either with or without the addition of coagulation chemicals.

- 1. <u>Basin design</u> Presedimentation basins should have hopper bottoms or be equipped with continuous mechanical sludge removal apparatus, and provide arrangements for dewatering. Ponds used for presedimentation should be designed to hold maximum 3-day usage.
- 2. <u>Inlet</u> Incoming water shall be dispersed across the full width of the line of travel as quickly as possible; short-circuiting must be prevented.
- 3. <u>Bypass</u> Provisions for bypassing presedimentation basins shall be included.
- 4. <u>Detention Time</u> Three (3) hours detention is the minimum period recommended. Greater detention may be necessary and is preferred.

10.2.2 <u>RAPID MIX</u> - Rapid mix shall mean the rapid dispersion of chemicals throughout the water to be treated, usually by violent agitation. The engineer shall submit the design basis for the velocity gradient (G value) selected, considering the chemicals to be added and water temperature, color and other related water quality parameters. The velocity gradient should not be less than 300 (ft/sec)/ft.

- 1. <u>Equipment</u> Basins should be equipped with mechanical mixing devices; other arrangements, such as baffling, in-line mixers may be acceptable.
- 2. <u>Mixing</u> The detention period should be not more than thirty (30) seconds.

- 3. <u>Location</u> The rapid mix and flocculation basin shall be as close together as possible.
- 4. <u>SCD</u> Install a streaming current detector for continuous monitoring of coagulant dosage to assist in optimizing the coagulation process.

10.2.3 <u>FLOCCULATION</u> - Flocculation shall mean the agitation of water at low velocities for long periods of time.

- 1. <u>Basin Design</u> Inlet and outlet design shall prevent short-circuiting and destruction of floc. A drain and/or pumps shall be provided to handle dewatering and sludge removal.
- 2. <u>Detention</u> The flow-through velocity shall be not less than 0.5 nor greater than 1.5 feet per minute with a detention time for floc formation of at least 30 minutes.
- 3. <u>Equipment</u> Agitators shall be driven by variable speed drives with the peripheral speed of paddles ranging from 0.5 to 3.0 feet per second. The speed of each successive agitator should be less than the previous one.
- 4. <u>Piping</u> Flocculation and sedimentation basins shall be as close together as possible. The velocity of flocculated water through pipes or conduits to settling basins shall be not less than 0.5 nor greater than 1.5 feet per second. Allowances must be made to minimize turbulence at bends and changes in direction.
- 5. <u>Other Designs</u> Baffling may be used to provide for flocculation in small plants only after consultation with the Division. The design should be such that the flow-through velocity shall be not less than 0.5 nor greater than 1.5 feet per minute with a detention time for floc formation of at least 30 minutes as noted above.

10.2.4 <u>SEDIMENTATION</u> - Sedimentation shall follow flocculation. The detention time for effective clarification is dependent upon a number of factors related to basin design and the nature of the raw water.

- a. The plant shall have a minimum of two (2) basins.
- b. Under optimal operation conditions, the design must allow the operator to be able to achieve a settled water turbidity of not more than 1 NTU prior to the filtration.
- c. The following criteria apply to sedimentation units:
 - 1. <u>Even Flow</u> Flow shall be evenly distributed to each basin from the flocculation chamber(s).

- 2. <u>Detention Time</u> Shall provide a minimum of four (4) hours of settling time. This may be reduced to two hours for lime-soda softening facilities treating only groundwater. Dependent upon the basin design and raw water quality, reduced sedimentation time may also be approved when equivalent effective settling is demonstrated (i.e. plate settlers); however, provisions should be made for more frequent removal of sludge from the basins than is required for conventional sedimentation.
- 3. <u>Ratio</u> Rectangular basins shall have a length to width ratio of 4:1 with an average depth of 8 feet. However, calculations using surface area, overflow rate and detention time should be used to determine the depth.
- 4. <u>Inlet Devices</u> Inlets shall be designed to distribute the water equally and at uniform velocities. Open ports, submerged ports, and similar entrance arrangements are required. A baffle should be constructed across the basin close to the inlet end and should project several feet below the water surface to dissipate inlet velocities and provide uniform flows across the basin. This velocity should not exceed 0.25 ft/sec.
- 5. <u>Outlet Devices</u> Outlet devices shall be designed to maintain velocities suitable for settling in the basin and to minimize short-circuiting. The use of submerged orifices is recommended in order to provide a volume above the orifices for storage when there are fluctuations in flow.
- 6. <u>Overflow Rate</u> The rate of flow over the outlet weir shall not exceed 20,000 gallons per day per foot of weir length. The overflow weir should be installed which will establish the maximum water level desired on top of the filters. They shall not be flooded. Adjustable V-notch weirs are preferred. Where submerged orifices are used as an alternate for overflow weirs, they should be not lower than three feet below the flow line with flow rates equivalent to weir loadings.
- 7. <u>Velocity</u> The velocity through settling basins shall not exceed 0.5 feet per minute. The basins must be designed to minimize short-circuiting. Fixed or adjustable baffles must be provided as necessary to achieve the maximum potential for clarification. Not applicable if tube or plate settlers are used.
- 8. <u>Overflow</u> An overflow weir (or pipe) should be installed which will establish the maximum water level desired on top of the filters. It shall discharge by gravity with a free fall at a location where the discharge will be noted.
- 9. <u>Sludge Collection</u> Mechanical sludge collection equipment should be provided.

- 10. <u>Drainage</u> Basins must be provided with a means for dewatering. Basin bottoms should slope toward the drain not less than one foot in twelve feet where mechanical sludge collection equipment is not required.
- 11. <u>Flushing Lines</u> Flushing lines or hydrants shall be provided and must be equipped with backflow prevention devices acceptable to the Division.
- 12. <u>Safety</u> Permanent ladders or handholds should be provided on the inside walls of basins above the water level. Guard rails should be included.
- 13. <u>Sludge Removal</u> Sludge removal design shall provide that:
 - (A) sludge pipes shall be not less than three inches in diameter and so arranged as to facilitate cleaning;
 - (B) entrance to sludge withdrawal piping shall prevent clogging;
 - (C) valves shall be located outside the tank for accessibility;
 - (D) the operator may observe and sample sludge being withdrawn from the unit.
- 14. <u>Sludge Disposal</u> must be accomplished in accordance with the applicable rules in effect.

10.2.5 <u>SOLIDS CONTACT UNIT</u> - Units are generally acceptable for combined softening and clarification where water characteristics, especially temperature, do not fluctuate rapidly, flow rates are uniform and operation is continuous. Before such units are considered as clarifiers without softening, the Division should be contacted before the design has started. Clarifiers should be designed for the maximum uniform rate and should be adjustable to changes in flow which are less than the design rate and for changes in water characteristics. A minimum of two (2) units are required for surface water treatment. The following are design criteria for consideration, but any design shall be submitted in detail to be reviewed on a case-by-case basis.

- a. <u>Installation of Equipment</u> Supervision by a representative of the manufacturer shall be provided with regard to all mechanical equipment at the time of:
 - 1. installation; and
 - 2. initial operation.
- b. <u>Operating Equipment</u> The following shall be provided for plant operation:
 - 1. a complete outfit of tools and accessories;
 - 2. necessary laboratory equipment;

- 3. adequate piping with suitable sampling taps so located as to permit the collection of samples of water from critical portions of the units.
- c. <u>Chemical Feed</u> Chemicals shall be applied at such points and by such means as to insure satisfactory mixing of the chemicals with the water.
- d. <u>Mixing</u> A rapid mix device or chamber ahead of solids contact units may be necessary to assure proper mixing of the chemicals applied. Mixing devices employed shall be so constructed as to:
 - 1. provide good mixing of the raw water with previously formed sludge particles; and
 - 2. prevent deposition of solids in the mixing zone.
- e. <u>Flocculation</u> Flocculation equipment:
 - 1. shall be adjustable (speed and/or pitch);
 - 2. must provide for coagulation in a separate chamber or baffled zone within the unit;
 - 3. should provide the flocculation and mixing period to be not less than 30 minutes.
- f. <u>Sludge Concentrators</u> The equipment should provide either internal or external concentrators in order to obtain a concentrated sludge with a minimum of waste water. Large basins should have at least two (2) sumps for collecting sludge with one (1) sump located in the central flocculation zone.
- g. <u>Sludge Removal</u> Sludge removal design shall provide that:
 - 1. sludge pipes shall be not less than three (3) inches in diameter and so arranged as to facilitate cleaning;
 - 2. entrance to sludge withdrawal piping shall prevent clogging;
 - 3. valves shall be located outside the tank for accessibility;
 - 4. operator may observe and sample sludge being withdrawn from the unit; and
 - 5. backflow from sanitary sewer systems be impossible.
- h. <u>Cross-Connections</u>
 - 1. Blow-off outlets and drains must terminate and discharge at places satisfactory to the Division.

- 2. Cross-connection control must be included for the potable water lines used to backflush sludge lines.
- i. <u>Detention Period</u> The detention time shall be established on the basis of the raw water characteristics and other local conditions that affect the operation of the unit. Based on design flow rates, the detention time should be:
 - 1. two to four hours for suspended solids contact clarifiers and softeners treating surface water; and
 - 2. one to two hours for the suspended solids contact softeners treating only ground water.
- j. <u>Suspended Slurry Concentrate</u> Softening units should be designed so that continuous slurry concentrates of one percent or more, by weight, can be satisfactorily maintained.
- k. <u>Water Losses</u> Units shall be provided with suitable controls for sludge withdrawal.
 - 1. Total water losses should not exceed five percent (5%) for clarifiers, and three percent (3%) for softening units.
 - 2. Solids concentration of sludge bled to waste should be three percent (3%) by weight for clarifiers, and five percent (5%) by weight for softeners.
- 1. <u>Weirs or Orifices</u> The units should be equipped with either overflow weirs or orifices constructed so that water at the surface of the unit does not travel over 10 feet horizontally to the collection trough. Weirs shall be:
 - 1. Adjustable, and at least equivalent in length to the perimeter of the tank;
 - 2. Weir loading shall not exceed:
 - (A) 10 gallons per minute per foot of weir length for units used for clarifiers;
 - (B) 20 gallons per minute per foot of weir length for units used for softeners;
 - (C) Where orifices are used, the loading rates per foot of launder rates should be equivalent to weir loadings. Either shall produce uniform rising rates over the entire area of the tank.
- m. <u>Upflow Rates</u> Unless supporting data is submitted to the Division to justify rates exceeding the following, rates shall not exceed:

- 1. 1.0 gallon per minute per square foot of area at the sludge separation line for units used for clarifiers,
- 2. 1.75 gallons per minute per square foot of area at the slurry separation line for units used for softeners.

10.2.6 <u>TUBE OR PLATE SETTLERS</u> - Proposals for settler unit clarification must include pilot plant and/or full scale demonstration satisfactory to the Division prior to the preparation of final plans and specifications for approval. Settler units consisting of variously shaped tubes or plates which are installed in multiple layers and at an angle to the flow may be used for sedimentation, following flocculation.

10.2.6.1 GENERAL CRITERIA

- a. <u>Inlet and Outlet Considerations</u> Design to maintain velocities suitable for settling in the basin and to minimize short-circuiting.
- b. <u>Drainage</u> Drain piping from the settler units must be sized to facilitate a quick flush of the settler units and to prevent flooding other portions of the plant.
- c. <u>Protection from Freezing</u> Although most units will be located within a plant, outdoor installations must provide sufficient freeboard above the top of settlers to prevent freezing in the units.
- d. <u>Application Rate</u> A maximum rate of 2 gal/ft²/min of cross-sectional area (based on 24-inch long 60 degree tubes or 39.5-inch long 7 ¹/₂degree tubes), unless higher rates are successfully shown through pilot plant or in-plant demonstration studies.
- e. <u>Flushing Lines</u> Flushing lines shall be provided to facilitate maintenance and must be properly protected against backflow or back siphonage.

10.3.0 FILTRATION

10.3.1 <u>GENERAL</u> - Acceptable filters shall be upon the discretion of the Division. The application of any one type must be supported by water quality data representing a reasonable period of time to characterize the variations in water quality. Experimental (pilot) treatment studies may be required to demonstrate the applicability of the method of filtration proposed. Filtration rates greater than 5 gpm/ft² are not recommended and may not be approved. All filters shall have provisions for filtering to waste. The design of the filter must allow the water operator to achieve a filtered water effluent of 0.1 NTU or less at each filter under optimal operating conditions.

10.3.2 <u>RAPID RATE GRAVITY FILTERS</u>:

- a. <u>Pretreatment</u> The use of rapid rate gravity filters shall require pretreatment.
- b. <u>Number</u> At least two (2) units shall be provided. Where only two units are provided, each shall be capable of meeting the plant design capacity (normally the projected maximum daily demand) at the approved filtration rate. Where more than two filter units are provided, the filters shall be capable of meeting the plant design capacity at the approved filtration rate with one filter removed from service. Where declining rate filtration is provided, the variable aspect of filtration rates, and the number of filters must be considered when determining the design capacity for the filters.
- c. <u>Rate of Filtration</u> The permissible rate of filtration shall be determined through consideration of such factors as raw water quality, degree of pretreatment provided, filter media, water quality control parameters, competency of operating personnel and other factors as required by the Division. The normal rate shall be 2 gpm/ft², and should not exceed 5 gpm/ft² of filter area, for turbidity removal plants.
- d. <u>High Rate Filtration</u> Filtration rates for turbidity or iron removal plants of up to 4 gpm/ft are acceptable with the following:
 - 1. Mixing flocculation, and sedimentation must meet the requirements of this document.
 - 2. Dual or mixed filter media must be used. Mixed filter media configuration is preferred.
 - 3. Full compliance with the current Surface Water Treatment Rules must be assured.
 - 4. Additional instrumentation and monitoring devices may be required for those plants with filter rates greater than 2 gpm/ft^2 .
 - 5. Any proposal to operate a conventional plant with a filtration rate greater than 4 gpm/ft² shall require performance of a high-rate pilot study, in accordance with the protocols acceptable to the Division. Filtration rates greater than 5 gpm/ft² may be considered on a case by case basis, but generally rates greater than 5 gpm/ft² are not recommended for surface water sources and may not be approved. Unconventional or package type water treatment plants using surface water sources shall not operate at filtration rates greater than 5 gpm/ft².
 - 6. Information listed below under the "high-rate guidelines" must be submitted to the Division for review and approval.

GUIDELINES FOR HIGH-RATE CONSIDERATION FOR FILTER RATES BETWEEN 2 AND 4 GPM/FT²

Prior to the Division's approval of increased filter rates between 2 and 4 gpm/ft^2 , the following items must be addressed and submitted for review and approval:

- (A) A demand for the extra water must be documented by indicating current water usage, unaccounted for water, water conservation guidelines, accurate population projections, and future water demands;
- (B) Complete and submit the "Information and Data Submittal Form";
- (C) Turbidity and/or particle count data on the raw or filter influent water and/or filtered effluent water should be available for EPD inspection (for existing plants, at least one year of data should be available);
- (D) The results of a simulated CT study at the proposed flow conditions must be provided. Please be reminded the required log inactivation *of Giardia* cysts must be achieved at the proposed plant flow capacity;
- (E) Baffling of the clearwell and sedimentation basin is required. Installation of plate or tube settlers in the sedimentation basin is preferred.
- (F) An application to increase the water withdrawal permit must be submitted to the Division's Water Resources Program.
- (G) Plans and specifications for any necessary modifications to the treatment plant must be submitted for review and approval.
- (H) After the above items have been submitted and concurred with, the Division may reduce or waive the requirement for an in-depth pilot study based on the submitted information and an onsite plant evaluation. A completed "Application to Operate a Public Water System" will be required in order to increase plant rates.

INFORMATION AND DATA SUBMITTAL FORM

GENERAL INFORMATIO	<u>N</u>			
Name of Facility:		V	WSID No:	
County:				
Permitted Flow Rate:	MGD	Proposed	l Flow Rate:	MGD
Permitted Filter Rate:	gpm/ft ²	Proposed	l Filter Rate:	gpm/ft ²
Raw Water Turbidity:	Year Max.	NTU	Year Avg	NTU
Water Plant Operator(s):	Year Min	NIU	Certification Lev	vel:
			Certification Lev	vel:
			Certification Lev	vel:
			Certification Lev	vel:
PLANT INFORMATION				
Particle Counter(s): Yes <u>Chemical Addition</u> Pre-Chemicals (Cl ₂ , alum, pol Taste and Odor Control:	Efflu ymer, etc.):	ent sensor(s)) location:	
Iron and Manganese Removal	:			
Flocculation Num	ber of Flocculato	ors:		
Type of Flocculators (baffles,	mechanical, plate	es, etc.):		
Mechanical Flocculator Stage	s: (If ap	plicable);	Functional:	Yes/No
Theoretical Detention Time:	Mi	nutes (at cur	rent capacity)	
Theoretical Detention Time:	Mi	nutes (at pro	posed capacity)	
Sedimentation Basins		Number o	f Basins:	
Baffles in Sedirnentation basin	n(s): YesNo	Plate	or Tube Settlers:Yes_	No
Weir Overflow Rate:		gpd/foot	of weir length (at curre	ent capacity).

Weir Overflow Rate:	gpd/foot of weir length (at proposed capacity)		
Theoretical Basin Detention Time:	Minutes (at current capacity)		
Theoretical Basin Detention Time:	Minutes (at proposed capacity)		
Filters:	Number of Filters:		
Filter Media Configuration:			
Type: Single: Dual:	Multi / Mixed:		
Other:			
Size and Depth of Media: Layer# I (Top	p):		
Layer #2 (Middle or Bottom):		
Layer #3 (Bottom- if applicable):		
Support La	ayer:		
Date Verified:	Backwash Flow Rate:gpm/ft2		
Filter Sweeps: Yes No typ	pe:Air Scour: Yes No		
Finished Water Turbidimeter(s): Online	Grab Sensor(s) location:		
DACKWASH/SLUDGE HANDING			
BACKWASH/ SLUDGE HANDLING			
Describe Sludge Handling/Removal Facilit	ies:		
LABORATORY EQUIPMENT			
	parameter's tested:		
Jar Test Equipment: Yes No			
Microbiological Test Equipment: Yes	No Certified: YesNo		

Note: Attach additional pages if necessary.

HIGH-RATE PILOT STUDY GUIDELINES FOR FILTER RATES ABOVE 4 GPM/FT²

In order to be approved to perform a high-rate pilot study, at filter rates above 4 gpm/ft² on treatments plants a detailed plant evaluation and a high-rate study plan which addresses the items listed in this sections must be submitted by a Registered Professional Engineer in the State of Georgia for review and concurrence.

- (A) A demand for the extra water must be documented by indicating current water usage, unaccounted for water, water conservation guidelines, accurate population projections, and future water demands;
- (B) A complete engineering evaluation, by a professional engineer licensed in the State of Georgia, of the existing facilities and unit process components, the proposed high-rate study plan, as well as the pertinent schematic drawings indicating the proposed flow rates through the unit processes. The evaluation must address the current treatment train and processes which includes flow rates, chemical addition points, sample points, weir overflow rates, simulated CT study, filter media configurations, plant storage, backwash water rates, sludge handling and pumps;
- (C) Verification of the availability of additional raw water must be provided. Please contact the Water Resources Management Program of the Division for water withdrawal requirements;
- (D) When required by the Division, turbidity and/or particle count data on the raw, settled or filter influent water and/or filtered effluent water for a duration of one year and;
- (E) An unconventional or package type water treatment plant using surface water with a proposed filtration rate 5 gpm/ft² will be required to have a Certified Class I Water Plant Operator in responsible charge while the plant is in operation.
- (F) After concurrence of the plant evaluation and the high-rate study plan (a through e above), the high-rate pilot study shall be conducted as follows:
 - 1) The study must be conducted a minimum of 180 days, covering at least two seasons, including a period of cold weather;
 - 2) The performance and results must be conducted under the supervision of a professional engineer licensed in the State of Georgia;
 - 3) At least two (2) daily (or one per shift) coliform bacteria or standard plate count analysis of the filtered water from the pilot test filter(s) and the non-test filter(s) shall be performed by a Division approved laboratory and tabulated for comparison. Water sample taps shall be available on the effluent line from each filter;

- 4) In addition to the turbidity measurements required for normal plant operations, turbidity measurements of the raw water must be made at least once (1) a shift and settled water [goal is 1. 0 NTU or less] and the pilot test filter(s) and non-test filter(s) effluents [goal is 0.1 NTU or less] must be made and recorded at least at two (2) hour intervals while the plant is in operation. During the study, the combined filter effluent should not exceed 0.3 NTU.
- 5) Any failure to comply with the current Drinking Water Standards during the pilot test period and/or if the combined filter effluent at the plant reaches or exceeds 1.0 NTU, the study must be terminated.
- 6) Tests shall be performed during the pilot study to determine the actual detention time in the pilot test sedimentation basin(s) along with an evaluation of short-circuiting and weir loading rates;
- 7) During the pilot study of the higher filtration rate, calculate and record the daily theoretical CT value, but report the lowest daily CT value calculated during each month and the corresponding log inactivation for *Giardia*;
- With a particle counting device, record and report the number (particles/ml of particles in the test and non-test filter(s) effluents at two (2) hour intervals, while the plant is in operation, in the size range between 3 and 15 microns;
- 9) Tests shall be performed every month for Total Organic Carbon (TOC) concentration from the effluent of the pilot test filter(s) and non-test filter(s) for comparison, prior to the point of continuous disinfectant application;
- 10) Simulated Distribution System (SDS) samples shall be collected every quarter from the effluent of the pilot test filter(s) and non-test filter(s) for total trihalomethanes (TTHMs) and total haloacetic acids (THAAs) analysis, to be performed by a private laboratory. The collected samples should be stored in a dark place and incubated at the same temperature and pH typically found in the distribution system for a reaction time comparable to the maximum detention time in the distribution system.
- 11) At the completion of the pilot study, the results from the above items along with any other pertinent findings (as well as recommendation) must be tabulated and submitted in a report form by the professional engineer.
- 12) Some plant design features may require additional evaluation or additional treatment studies (i.e. polymer and/or ferric chloride feed, enhanced coagulation, GAC, plate settlers, pre-settling units, deeper filter media configurations, or pilot plants) and/or a longer pilot study.

- (G) Upon completion of a successful pilot study, the following minimum improvements must be completed at the water plant prior to the final approval and modification of the system's operating permit:
 - 1) Based upon the results, submit engineering design plans and specifications for the necessary plant modifications, for Division's review and approval;
 - 2) For filtration rates exceeding 4 gpm/ft² mixed media or deep-bed dualmedia, with an acceptable agitation system, must be provided in all filters;
 - 3) The system must currently be in compliance with the Federal Surface Water Treatment Regulations (SWTR), as adopted by Georgia;
 - 4) Provisions to filtering to waste after a filter backwash cycle;
 - 5) Provisions for continuous sludge removal in each sedimentation basin;
 - 6) Adequate settled solids facilities to treat basin sludge and backwash water;
 - 7) The operator in responsible charge of the water plant must be Class I Certified;
 - 8) Modification of the Surface Water or Groundwater Withdrawal Permit;
 - 9) Assurances that adequate wastewater treatment facilities will be available to treat the additional wastewater generated by the increased water plant capacity and;
 - 10) Additional improvements identified during the pilot study or as deemed necessary by the Division, may be required.

10.3.3 <u>FILTER STRUCTURAL DETAILS AND HYDRAULICS</u> - The filter structure shall be designed to provide for:

- a. vertical walls within the filter;
- b. no protrusion of the filter walls into the filter media;
- c. cover by superstructure as determined necessary under local climate;
- d. head room to permit normal inspection and operation;
- e. minimum depth of filter box of 8-1/2 feet;
- f. minimum water depth over the surface of the filter media of three (3) feet;

- g. trapped effluent to prevent backflow of air to the bottom of the filters;
- h. prevention of floor drainage to the filter with a minimum 4-inch curb around the filters;
- i. prevention of flooding by providing overflow;
- j. maximum velocity of treated water in pipe and conduits to filters of two feet per second;
- k. cleanouts and straight alignment for influent pipes or conduits where solids loading is heavy, or following lime-soda softening;
- 1. washwater drain capacity to carry maximum flow;
- m. walkways around filters, to be not less than 24 inches wide;
- n. safety handrails or walls around filter areas adjacent to normal walkways;
- o. construction to prevent cross connections and common walls between potable and non-potable water.
- 10.3.4 <u>WASHWATER TROUGHS</u> Washwater troughs should be constructed to have:
 - a. the bottom elevation above the maximum level of expanded media during washing;
 - b. a two-inch freeboard at the maximum rate of wash; At minimum, the troughs should be sized to accommodate backwash flow rates of 20 gpm/ft^2 without flooding.
 - c. the top edge level and all at the same elevation;
 - d. spacing so that each trough serves the same number of square feet of filter area;
 - e. maximum horizontal travel of suspended particles to reach the trough not to exceed three (3) feet.

10.3.5 <u>FILTER MATERIAL</u> – Installation of media shall be in accordance with the current AWWA Standards.

10.3.5.1 <u>SAND</u> - The media shall be clean silica sand, having the following characteristics:

- a. a total depth of not less than 24 inches and generally not more than 30 inches;
- b. an effective size range of the smallest material no greater than 0.45 mm to 0.55 mm;
- c. a uniformity coefficient of the smallest material not greater than 1.65;
- d. a minimum of 12 inches of media with an effective size range no greater than 0.45 mm to 0.55 mm, and a specific gravity greater than other filtering materials (i.e. anthracite) within the filter.
- 10.3.5.2 <u>ANTHRACITE</u> A combination of clean crushed anthracite and sand can be used. The anthracite shall have:
 - a. an effective size of 0.8 mm 1.2 mm;
 - b. a uniformity coefficient not greater than 1.85;
 - c. a hardness of 2.7 3 (MOH Scale)
 - d. anthracite layer shall not exceed 20 inches in a 30-inch bed.
- 10.3.5.3 <u>MIXED MEDIA</u> To be approved by the Division.
- 10.3.5.4 <u>TORPEDO SAND</u> A three-inch layer of torpedo sand should be used as a supporting media for filter sand, and should have:
 - a. effective size of 0.8 mm to 2.0 mm; and
 - b. uniformity coefficient not greater than 1.7.
- 10.3.5.5 <u>GRANULAR ACTIVATED CARBON (GAC)</u> Granular activated carbon media may be considered only after pilot or full scale testing and with prior approval of the Division. The design shall include the following:
 - a. The media must meet the basic specifications for filter media as given in this document except that larger size media may be allowed by the Division where full scale tests have demonstrated that treatment goals can be met under all conditions.

- b. There must be provisions for a free chlorine residual and adequate contact time in the water following the filters and prior to distribution.
- c. There must be means for periodic treatment of filter material for control of bacterial and other growth.
- d. Provisions must be made for frequent replacement or regeneration if GAC is used for filtration.
- 10.3.5.6 <u>OTHER MEDIA</u> Other media may be considered based on experimental data and operating experience.
- 10.3.5.7 <u>GRAVEL</u> Gravel, when used as the supporting media shall consist of hard, durable, rounded silica particles and shall not include flat or elongated particles.
 - a. The coarsest gravel shall be $2\frac{1}{2}$ inches in size when the gravel rests directly on the strainer system, and must extend above the top of the perforated laterals.
 - b. Not less than four layers of gravel shall be provided in accordance with the following size and depth distribution when used with perforated laterals:

Size	Depth
2 1/2 to 1 1/2 inches	5 to 8 inches
1 1/2 to 3/4 inches	3 to 5 inches
3/4 to $1/2$ inches	3 to 5 inches
1/2 to $3/16$ inches	2 to 3 inches
3/16 to 3/32 inches	2 to 3 inches

- c. Reduction of gravel depths may be considered upon justification when proprietary filter bottoms are specified.
- d. The depth of any gravel layer should not be less than 2 inches or less than twice the largest gravel size for that layer, whichever is greater. The bottom layer should be thick enough to cover underdrain laterals, strainers, or other irregularities in the filter bottom. The total depth of gravel above the underdrains should not be less than ten (10) inches.

10.3.6 <u>FILTER BOTTOMS AND STRAINER SYSTEMS</u> - Departures from these standards may be acceptable for high rate filters and for proprietary bottoms. Porous plate bottoms shall not be used. The design of manifold-type collection systems shall be such as to:

- a. minimize loss of head in the manifold and laterals;
- b. assure even distribution of washwater and even rate of filtration over the entire area of the filter;
- c. provide the ratio of the area of the final openings of the strainer systems to the area of the filter at about 0.003;
- d. provide the total cross-sectional area of the laterals at about twice the total area of the final openings;
- e. provide the cross-sectional area of the manifold at 1-1/2 to 2 times the total area of the laterals.

10.3.7 <u>SURFACE WASH OR SUBSURFACE WASH</u> - Surface or subsurface wash facilities are required except for filters used exclusively for iron or manganese removal, and may be accomplished by a system of fixed nozzles or a revolving-type apparatus. All devices shall be designed to insure maximum agitation over the entire filter area and include:

- a. provision for water pressures of at least 45 psi; Higher pressures of 65-100 psi may be necessary for the proper operation of the revolving-type surface wash apparatus depending upon the diameter of the arms.
- b. arms of the revolving-type surface wash apparatus should be placed about 2 inches above the surface of the unexpanded filter media;
- c. a properly installed vacuum breaker or other approved device (i.e. double check valve or reduced pressure zone backflow preventer) to prevent back siphonage if connected to the treated water system;
- d. rate of flow of 2.0 gpm/ft² of filter area with fixed nozzles or 0.5 gpm/ft² with revolving arms.

10.3.7.1 <u>AIR SCOURING</u> - Air scouring can be considered in place of surface wash.

a. air flow for air scouring the filter must be 3-5 standard cubic feet per minute per square foot of filter area when the air is introduced in the underdrain; a lower air rate must be used when the air scour distribution system is placed above the underdrains;

- b. a method for avoiding excessive loss of the filter media during backwashing must be provided;
- c. air scouring must be followed by a fluidization wash sufficient to restratify the media;
- d. air must be free from contamination;
- e. air scour distribution systems should be placed below the media and supporting bed interface; if placed at the interface the air scour nozzles shall be designed to prevent media from clogging the nozzles or entering the air distribution system;
- f. piping for the air distrubtion system shall not be flexible hose which will collapse when not under air pressure and shall not be a relatively soft material which may erode at the orifice opening with the passage of air at high velocity;
- g. air delivery piping shall not pass down through the filter media nor shall there be any arrangement in the filter design which would allow short circuiting between the applied unfiltered water and the filtered water;
- h. consideration should be given to maintenanace and replacement of air deliver piping;
- i. the backwash delivery system must be capable of 15 gallons per minute per square foot of filter surface area; however, when air scour is provided the backwash rate must be variable and should not exceed 8 gallons per minute per square foot unless operating experience shows that a higher rate is necessary to remove scoured particles from filter surfaces;
- j. the filter underdrains shall be designed to accommodate air scour piping when the piping is installed in the underdrain; and
- k. the provisions for backwash, as stated below, shall be followed.

10.3.8 <u>APPURTENANCES</u> - The following shall be provided for every filter:

- a. influent and effluent sampling taps;
- b. an indicating loss of head gauge;
- c. an indicating rate-of flow control. A modified rate controller which limits the rate of filtration to a maximum rate may be used. However, equipment that simply maintains a constant water level on the filters is not acceptable, unless the rate of flow onto the filter is properly controlled.

- d. a turbidimeter with continuous turbidity reading in NTUs and a recorder;
- e. a sensor on the effluent pipe connected to an online continuous particle counting device (and data processing system) for counting particles in a size range between 3 and 15 microns;
- f. wall sleeves providing access to the filter interior at several locations for sampling or pressure sensing;
- g. a 1 to 1-1/2 inch pressure hose and storage rack at the operating floor for washing filter walls. The hose connection shall be protected with a vacuum breaker;
- h. provisions for filtering to waste with appropriate measures for backflow prevention.
- 10.3.9 <u>BACKWASH</u> Provisions shall be made for washing filters as follows:
 - a. a minimum rate of 15 gallons per minute per square foot, consistent with water temperatures and specific gravity of the filter media. A rate of 20 gallons per minute per square foot or a rate necessary to provide for a 50 percent expansion of the filter bed is recommended. A reduced rate of 10 gallons per minute per square foot may be acceptable for full depth anthracite or granular activated carbon filters;
 - b. filtered water provided at the required rate by washwater tanks, a washwater pump, from the high service main, or a combination of these;
 - c. washwater pumps in duplicate unless an alternate means of obtaining washwater is available;
 - d. water supply to backwash one filter for not less than 15 minutes at the design rate of wash;
 - e. a washwater regulator or valve on the main washwater line to obtain the desired rate of filter wash with the washwater valves on the individual filters open wide;
 - f. a rate-of-flow indicator, preferably with a totalizer, on the main washwater line located so that it can be easily read by the operator during the washing process;
 - g. after washwater pumps are turned off and influent line opened, a rewash cycle shall be performed, during which period the water is filtered to waste until the turbidity is stabilized at approximately 0.3 NTU. Piping must be provided for this purpose to assure that the water is filtered to waste at a rate equivalent to the permitted filtration rate.
 - h. design to prevent rapid changes in backwash water flow.

10.3.10 <u>MISCELLANEOUS</u> - Roof drains shall not discharge into the filters or basins and conduits preceding the filters. Preferably, all filters be enclosed.

10.4.0 <u>PRESSURE FILTERS</u> - The normal use of these filters is for iron and manganese removal. Pressure filters shall not be used in the filtration of surface or other polluted waters, or following lime-soda softening.

10.4.1 <u>GENERAL</u> - Minimum criteria relative to number, rate of filtration, structural details and hydraulics, filter media, etc., provided for rapid rate gravity filters also apply to pressure filters where appropriate. Preferably, the rate shall not exceed three (3) gallons per minute per square foot of filter area.

10.4.2 <u>DETAILS OF DESIGN</u> - The filters shall be designed to provide for:

- a. loss of head gauges on the inlet and outlet pipes of each filter;
- b. an easily readable meter or flow indicator on each battery of filters. A flow indicator is to be installed for each filtering unit.
- c. filtration and backwashing of each filter individually with an arrangement of piping as simple as possible to accomplish these purposes;
- d. minimum side wall shell height of five feet. A corresponding reduction in side wall height is acceptable where proprietary bottoms permit reduction of the gravel depth.
- e. the top of the washwater collectors to be at least 18 inches above the surface of the media;
- f. the underdrain system to efficiently collect the filtered water and to uniformly distribute the backwash water at a rate not less than 15 gallons per minute per square foot of filter area;
- g. backwash flow indicators and controls that are easily readable while operating the control valves;
- h. an air release valve on the highest point of each filter;
- i. an accessible manhole to facilitate inspection and repairs;
- j. means to observe the wastewater during backwashing;
- k. construction to prevent cross-connection.

10.5.0 <u>DIATOMACEOUS EARTH FILTRATION</u> - The use of these filters may be considered for application to surface waters with low turbidity and low bacterial contamination, and may be used for iron removal for groundwaters provided the removal is effective and the water is of satisfactory sanitary quality before treatment.

- 10.5.1 <u>CONDITIONS OF USE</u> Diatomaceous earth filters are expressly excluded from consideration for the following conditions:
 - a. bacteria removal;
 - b. color removal;
 - c. turbidity removal where either the gross quantity of turbidity is high or the turbidity exhibits poor filterability characteristics;
 - d. filtration of waters with high algae counts.
- 10.5.2 <u>PILOT PLANT STUDY</u> Installation of a diatomaceous earth filtration system shall be preceded by a pilot plant study on the water to be treated.
 - a. Conditions of the study such as duration, filter rates, head loss accumulation, slurry feed rates, turbidity removal, bacteria removal, etc., must be approved by the Division prior to the study.
 - b. Satisfactory pilot plant results must be obtained prior to preparation of final construction plans and specifications.
 - c. The pilot plant study must demonstrate the ability of the system to meet applicable drinking water standards at all times.
 - 10.5.3 <u>TYPES OF FILTERS</u> Pressure or vacuum diatomaceous earth filtration should be considered. However, the vacuum type is preferred for its ability to accommodate a design which permits observation of the filter surfaces to determine proper cleaning, damage to a filter element, and adequate coating over the entire filter area.
 - 10.5.4 <u>TREATED WATER STORAGE</u> Treated water storage capacity in excess of normal requirements shall be provided to:
 - a. allow operation of the filters at a uniform rate during all conditions of system demand at or below the approved filtration rate; and,

- b. guarantee continuity of service during adverse raw water conditions without by-passing the system.
- 10.5.5 <u>NUMBER OF UNITS</u> At least two (2) units shall be provided.
- 10.5.6 <u>PRECOAT</u> The precoat shall conform to following:
 - a. <u>Application</u> A uniform precoat shall be applied hydraulically to each septum by introducing a slurry to the tank influent line and employing a filter-to-waste or recirculation system.
 - b. <u>Quantity</u> Diatomaceous earth in the amount of 0.1 pounds per square foot of filter area or an amount sufficient to apply a 1/16 inch coating should be used with recirculation. When precoating is accomplished with a filter-to-waste system, 0.15 to 0.2 pounds per square foot of filter area is recommended.
- 10.5.7 <u>BODY FEED</u> A body feed system to apply additional amounts of diatomaceous earth slurry during the filter run is required to avoid short filter runs or excessive head losses.
 - a. Quantity Rate of body feed is dependent on raw water quality and characteristics and must be determined in the pilot plant study.
 - b. Operation and maintenance can be simplified by providing accessibility to the feed system and slurry lines.
 - c. Continuous mixing of the body feed slurry is required.

10.5.7 <u>FILTRATION</u>

- a. <u>Rate of Filtration</u> The recommended nominal rate is 1.0 gallon per minute per square foot of filter area with a recommended maximum of 1.5 gallons per minute per square foot. The filtration rate shall be controlled by a positive means.
- b. <u>Head Loss</u> The head loss shall not exceed 30 psi for pressure diatomaceous earth filters, or a vacuum of 15 inches of mercury for a vacuum system.
- c. <u>Recirculation</u> A recirculation or holding pump shall be employed to maintain differential pressure across the filter when the unit is not in operation in order to prevent the filter cake from dropping off the filter

elements. A minimum recirculation rate of 0.1 gallon per minute per square foot of filter area shall be provided.

- d. <u>Septum or Filter Element</u> The filter elements shall be structurally capable of withstanding maximum pressure and velocity variations during filtration and backwash cycles, and shall be spaced such that no less than one inch is provided between elements or between any element and a wall.
- e. <u>Inlet Design</u> The filter influent shall be designed to prevent scour of the diatomaceous earth from the filter element.

10.5.8 <u>BACKWASH</u> - A satisfactory method to thoroughly remove and dispose of spent filter cake shall be provided.

10.5.8.1 <u>APPURTENANCES</u> - The following shall be provided for every filter:

- a. sampling taps for raw and filtered water;
- b. loss of head or differential pressure gauge;
- c. rate-of-flow indicator, preferably with totalizer;
- d. a throttling valve used to reduce rates below normal during adverse raw water conditions;
- e. evaluation of the need for body feed, recirculation and any other pumps in accordance with this document.

10.5.9 <u>MONITORING</u> - An on-line continuous particle counting device and a continuous monitoring turbidimeter with recorder on the filter effluent is required for plants treating surface water.

10.6.0 <u>DECLINING RATE FILTRATION</u> - This is a design where no rate-of-flow controllers are installed. The rate of flow through the filter media is greatest when the media has just been back washed and gradually declines as the media becomes filled with contaminants.

- a. The design must include means to insure that the water level during operation will not fall below the level of the top of the media.
- b. The filtration rate must not exceed 6 gpm/ft² when the filter is clean (immediately following backwash) and uses dual or mixed media.
- c. This design is normally appropriate only when four (4) or more filters are used in the plant.

10.7.0 DIRECT FILTRATION

10.7.1 <u>GENERAL</u>: Direct filtration, as used herein, refers to the filtration of a surface water without prior settling. The nature of the treatment process will heavily depend upon the raw water quality. A full scale direct filtration plant shall not be constructed without prior pilot studies which are acceptable to the Division. Where direct filtration is proposed, an engineering report shall be submitted prior to conducting pilot plant.

- a. Will be considered on a case-by basis.
- b. However, all filters shall have dual or mixed media and be operated at a rate between 2 and 5 gpm/ft^2 .
- c. A flash mix and flocculation basins shall be provided.

10.7.2 <u>ENGINEERING REPORT</u> - In addition to the items previously stated in this document under "Engineering Report", the report should include a historical summary of meteorological conditions and of raw water quality with special reference to fluctuations in quality, and possible sources of contamination. The following raw water parameters should be evaluated in the report:

- a. color;
- b. turbidity;
- c. microbiological/pathogen concentration;
- d. microscopic biological organisms;
- e. temperature;
- f. total solids;
- g. general inorganic, organic chemical and radiological characteristics;
- h. additional parameters as may be required by the Division.

10.7.2.1 The report should also include a description of methods and work to be done during a pilot plant study or where appropriate an in-plant demonstration study.

10.8.0 <u>PILOT PLANT STUDIES</u> - After approval of the engineering report, a pilot study or in-plant demonstration study shall be conducted when required by the Division.

a. The study must be conducted over a sufficient time to treat all expected raw water conditions throughout the year.

- b. The study shall emphasize but not be limited to, the following items:
 - 1. chemical mixing conditions including shear gradients and detention periods;
 - 2. chemical feed rates;
 - 3. use of various coagulants and coagulant aids;
 - 4. flocculation conditions;
 - 5. filtration rates;
 - 6. filter gradation, types of media and depth of media;
 - 7. filter breakthrough conditions; and
 - 8. adverse impact of recycling backwash water due to solids, pathogens, algae, disinfection by-products formation and similar problems.
- c. Prior to the initiation of design plans and specifications, a final report including the engineer's design recommendations shall be submitted to the Division for review and approval.
- d. The pilot plant filter must be of a similar type and operated in the same manner as proposed for full scale operation.
- e. The pilot study must demonstrate the minimum contact time necessary for optimum filtration for each coagulant proposed.

10.8.1 <u>PRETREATMENT</u> - Rapid mix and flocculation - The final rapid mix and flocculation basin design should be based on the pilot plant or in-plant demonstration studies augmented with applicable portions of this document.

10.8.2 <u>FILTRATION</u> - Filters should be rapid rate gravity filters with dual or mixed media. The final filter design should be based on the pilot plant or in-plant demonstration studies augmented by applicable portions and in conformance with this document. Pressure filters or single media sand filters shall not be used.

10.8.3 <u>CONTROL AND OPERATION</u> – An online continuous particle counting device equipped with dual sensors and data processing system to demonstrate continuous removal of particles in a size range between 3 and 15 microns shall be installed. A continuous recording turbidimeter shall also be installed on each filter effluent line and on the composite filter effluent line. Additional continuous monitoring equipment, such

as a streaming current detector, shall be provided to assist in control of coagulant dosage in optimizing the coagulation process.

10.8.4 <u>SITING REQUIREMENTS</u> - The plant design and land ownership surrounding the plant shall allow for the installation of conventional sedimentation basins should it be found that such are necessary.

10.9.0 <u>SMALL WATER SYSTEM TECHNOLOGY</u>

10.9.1 PACKAGE TREATMENT PLANTS AND ALTERNATIVE TECHNOLOGIES

10.9.1.1 <u>GENERAL</u> - These will be reviewed on a case-by-case basis based on pilot study demonstrated performance criteria. Membranes, cartridge filters and other alternative technologies may be considered at the discretion of the Division based on pilot study results and quality of the raw water supply.

10.9.2 PACKAGE PLANTS

- a. Package plants using surface water sources shall meet the water treatment standards, procedures and instrumentation stated in this document.
- b. Withdrawal of water directly from a surface source (i.e. river, stream, creek, lake, etc.) shall not be allowed.
- c. A presedimentation treatment as discussed under "Presedimentation" section in the document and/or a plant reservoir with at least three-day storage capacity that would provide equivalent treatment shall be provided for the water entering the package treatment plant.
- d. The turbidity concentration of the raw water entering the plant shall be consistently low (preferably not more than 10 NTU). In any case, it is preferred that the raw water supply source experience not more than a 20 NTU variation within any given 24 hour period.
- e. Due to compressed treatment times, the operation of package treatment plants is even more critical than for conventional treatment plants.
- f. The package plants should not operate in total automation mode without a qualified certified water operator available at all times to make the necessary treatment adjustments.

g. It is necessary that the operators of package plants are fully trained by the plant manufacturer's representatives.

10.9.3 OTHER ALTERNATIVE SURFACE WATER FILTRATION TECHNOLOGIES

- a. Pilot plant studies shall be performed to demonstrate that the specific technology, in combination with the disinfection treatment, shall accomplish the required level of log removal of *Giardia* cysts and viruses and/or *Cryptosporidium* cysts, as specified by the drinking water standards.
- b. The following stages of evaluation shall be performed:
 - 1. The first stage is to determine if the process effectively removes/inactivates the contaminants of concern;

The alternative filtration technology, in combination with disinfection treatment must consistently achieve a minimum of 99.9 percent removal and/or inactivation *Giardia lamblia* cysts and 99.99 percent removal and/or inactivation of viruses, and a minimum of 99 percent removal of *Cryptosporidium* oocysts.

- 2. The second stage is to determine if the individual system can effectively operate the process and to asses site-specific considerations that can affect the technology's performance.
- c. In order to assure influent water quality within the designed criteria, pretreatment may be necessary with certain waters.
- d. The level of water treatment operator skills and qualifications must be compatible with each piece of unit technology specified.

PART 11 - DISINFECTION

11.1.0 <u>GENERAL</u> - Chlorine is the disinfecting agent commonly used. Chlorination may be accomplished with liquid chlorine, calcium or sodium hypochlorites or chlorine dioxide. Other disinfecting agents will be considered, providing reliable application equipment is available and testing procedures for a residual are recognized in "Standard Methods for the Examination of Water and Wastewater," latest edition.

11.1.1 CHLORINATION EQUIPMENT

- a. <u>Type</u> Solution-feed gas chlorinators or hypochlorite feeders of the positive displacement type are acceptable.
- b. <u>Capacity</u> The chlorinator capacity shall be such that a free chlorine residual of at least two (2) milligrams per liter (mg/L) can be maintained in the water after contact time of at least 30 minutes when maximum flow rate coincides with anticipated maximum chlorine demand. The equipment shall be of such design that it will operate accurately over the desired feeding range.
- c. <u>Standby Equipment</u> Where chlorination is required for protection of the supply, standby equipment of sufficient capacity shall be available to replace the largest unit. Spare parts shall be made available to replace parts subject to wear and breakage. If there is a large difference in feed rates between routine and emergency dosages, a gas metering tube should be provided for each dose range to ensure accurate control of the chlorine feed.
- d. <u>Automatic Switchover</u> Automatic switchover of chlorine cylinders shall be provided, where necessary, to assure continuous disinfection. All surface water treatment plants must comply with this requirement.
- e. <u>Automatic Proportioning</u> Automatic proportioning chlorinators will be required where the rate of flow or chlorine demand is not reasonably constant or where the quality of the water is subject to rapid changes..
- f. <u>Eductor</u> Each eductor must be selected for the point of application with particular attention given to the quantity of chlorine to be added, the maximum injector waterflow, the total discharge back pressure, the injector operating pressure and the size of the chlorine solution line. Gauges for measuring water pressure and vacuum at the inlet and outlet of each eductor should be provided.

g. <u>Injector/Diffuser</u> – The chlorine solution injector/diffuser must be compatible with the point of application to provide a rapid and thorough mix with all the water being treated. The center of a pipeline is the preferred application point.

11.1.2 CONTACT TIME AND POINT OF APPLICATION

11.1.2.1 <u>GENERAL</u> – Due consideration shall be given to the contact time of the chlorine in water with relation to pH, ammonia, taste-producing substances, temperature, bacterial quality, trihalomethanes formation potential and other pertinent factors. Chlorine should be applied at a point which will provide adequate contact time. All basins used for disinfection must be designed to minimize short circuiting.

- a. Water must be continuously chlorinated to maintain a detectable residual of free chlorine in all parts of the distribution system in the recommended amount of at least 0.2 parts per million.
- b. As a minimum, at plants treating groundwater, provisions should be made for applying chlorine to the detention basin inlet and water entering the distribution system.
- c. Water from a spring shall be disinfected and retained in a detention tank for a minimum of thirty (30) minutes unless otherwise approved by the Division; and such additional water treatment as the Division may require for the drinking water to comply with the rules.
- d. Chemical feed equipment shall be of such design and capacity to accurately supply, at all times, the treatment chemicals required.
- e. At plants treating surface water, provisions should be made for applying chlorine to the raw water, settled water, filtered water and water entering the distribution system. The contact time (CT) as required by the Division must be provided after filtration to achieve the level of inactivation of *Giardia* cysts and viruses through disinfection. The required CT shall be determined by conducting tracer studies as outlined in this section.

11.1.2.2 PROCEDURES FOR CONDUCTING TRACER STUDIES

11.1.2.2.1 The effectiveness of <u>Giardia</u> inactivation in a water treatment plant can be demonstrated through "CT" studies. The Surface Water Treatment Rule (SWTR) Guidance Manual defines CT as the residual disinfectant value multiplied by the minutes of available contact time. The time is measured from the disinfectant application point to the point where the residual is measured. For the inactivation of *Giardia* to meet SWTR requirements, only contact time prior to the first customer can be counted. Contact time, T_{10} (detention time for the calculation of CT), is defined as the point where 90% of the flow passing through a unit (clearwell, wetwell, storage tank, etc.) is retained within the

unit. Flow through a pipe is calculated as plug flow and the total volume is included in the CT determination. That means to determine the contact time in minutes in a pipeline, calculate the volume of the pipeline in gallons and divide it by the maximum flow rate in gallons per minute.

Detention time established by tracer tests may be used to estimate "CT" with flow rates less than or equal to the tracer test flow. For this reason, use of worst case evaluations can provide reliable CT value determinations under all permitted operating conditions. This may eliminate the need for conducting multiple studies at several different plant flows. Once CT has been calculated (remember CT is the product of the retention time (T,,) in minutes and the disinfectant residual in mg/L measured at the exit/end of the unit or pipeline), the log inactivation of *Giardia* can be determined using the "CT Table" that corresponds to the water temperature and pH.

The Guidance Manual (GM) describes two procedures for determining contact time using tracer materials. Both procedures involve measuring tracer concentrations versus time. The <u>step-dose</u> procedure is readily adaptable to most Georgia water plants because existing equipment can be utilized with minimal modifications. The <u>slug-dose</u> procedure may require some plant modifications and offers no advantage over the former procedure. Only the <u>step-dose</u> procedure for conducting a tracer study to determine T_{10} is outlined in this document.

Recommended tracer materials are fluoride compounds due to availability, cost and compatibility with existing plant equipment. In addition, fluoride concentration is easily measured with routine laboratory analyses using existing equipment. Depending on baseline concentrations, application of 3 mg/L of fluoride should be adequate. The maximum fluoride level should not exceed 4.0 mg/L. To insure accurate results, the selected test method should be conducted maintaining constant plant flow rates (at maximum or worst case) and plant finished water storage volume representing no more than 30% of capacity. During the study, finished water outflow (pumped or gravity flow) should equal or exceed plant inflow to provide conservative CT value estimates.

Using the recommended step-dose method, a constant tracer addition is started and timed until the concentration stabilizes at the sampling point. If the fluoride addition is then discontinued, the receding fluoride values may be monitored and used for verification purposes. In contrast, the slug-dose method requires an instantaneous tracer addition and measurement at the sampling point over time. Successful use of this method is directly related to post chemical mixing efficiency to avoid distortions associated with density currents.

Before attempting a tracer test, the plant supervisor should develop a plan to insure proper coordination of all system components. The planning must provide a system balance while conducting the test, which precludes activities, such as filter backwashing, which could significantly distort test results. Some plants may have site specific features that require modification to properly conduct a tracer test. Please call the Drinking Water Program for information if there are questions concerning areas not listed in the attached procedures.

11.1.2.2.2 **TRACER TEST PROCEDURES**

- 1. Select tracer chemical. Fluoride compounds are used in virtually all surface water treatment plants in Georgia and are the recommended choice.
- 2. The total fluoride concentration should not exceed 4 mg/L. Remember to verify the available fluoride content of the product being used for your study. Sodium silicofluoride usually contains about 60% available fluoride, while sodium fluoride contains about 44% fluoride.
- 3. Discontinue routine fluoride application 24 to 48 hours prior to the scheduled tracer study. This will allow the fluoride level in the water in the clearwell to drop to background (baseline concentration).
- 4. Determine the tracer (fluoride) background level by testing filtered water prior to fluoride addition. Do not start the study until the fluoride concentration in the water leaving the plant is the same as the background level.
- 5. Provide a bypass flush connection to waste on the fluoride solution line just prior to its application (injection) point.
- 6. Adjust the fluoride output to the desired application rate (this value is referred to as C_0) and verify by weighing output several times, especially if using a volumetric feeder. Verify the feed rate again about midway and at the conclusion of the test. (If significant output variations are noted, a repeat test may be required.) After obtaining the desired feed output, operate the feeder for 30 minutes while discharging the fluoride solution to waste at the application (injection point). This procedure will allow the fluoride concentration to stabilize in the feeder solution chamber and pipe.

Example: Using sodium silicofluoride as the selected tracer, the amount of chemical required is determined as follows:

- 1. Assume 60% fluoride concentration
- 2. Application (dosage) rate of $3 \text{ mg/L}(C_0)$
- 3. 1 MGD plant flow

Calculation:

 $\frac{8.34 \text{ x } 1.0 \text{ MGD } \text{ x } 3 \text{ mg/L}}{0.60} = 41.7 \text{ lbs}$

 $\frac{41.7 \text{ lbs } x \quad 454 \text{ grams/lb}}{1440} = 13.1 \text{ grams/min} \quad \text{Na}_2\text{SiF}_6 \text{ required from the feeder}$

- 7. The sampling point should represent direct discharge into the distribution system. Excessively long sample lines or taps from plant service water lines can distort actual detention values and must be avoided. In some cases installation of representative sampling tap(s) may be necessary.
- 8. Close the bypass flush valve and start allowing the fluoride solution into the filtered water through the injection point. Note and record the time (a stopwatch is recommended) and begin sampling the finished water leaving the clearwell/plant at 3 to 5 minute intervals using clean, clearly marked sampling containers. Continue sampling until the fluoride concentration in the finished water has stabilized for several sampling intervals. The stabilized fluoride concentration should be approximately equal to the fluoride dose applied (3 mg/L in the previous example) plus the background (baseline) concentration contained in the filtered water prior to fluoride addition. Note: if your clearwell has a large theoretical retention time (greater than 4 hours), sampling may be conducted at 10 minute intervals for the first 30 minutes, or until a tracer concentration above baseline is first detected. Once a concentration change is first observed, immediately change to the 3 to 5 minute sampling interval. For verification of the test, the tracer (fluoride) feed should be discontinued, and the receding fluoride concentration at the effluent should be sampled and monitored at the same frequency (3 to 5 minute intervals) until the fluoride concentration returns to background. The time at which the fluoride feed is stopped is time zero for the receding tracer test and must be noted. The receding tracer test will provide a replicate set of measurements which can be compared with data derived from the rising tracer concentration versus time curve.
- 9. Fluoride analyses should be conducted using standardized instrumentation, fresh reagents and clean glassware. Fluoride levels exceeding about 2.0 mg/L must be accurately diluted with distilled water before calorimetric analysis.
- 10. During the tracer test, the analytical results versus time should be tabulated in the columns on the enclosed "Step-Dose Tracer Test Data" form and used to determine T_{10} as shown in the following example taken from the SWTR Guidance Manual.
- 11. For each tracer study performed, a completed copy of the enclosed "Tracer Study Report" form, the "Step-Dose Tracer Test Data" form and a copy of the graphical analysis for determining T_{10} (see Figure C-1, a graph of C/C₀ vs. Time) must be submitted to the Division.

EXAMPLE from U.S.EPA SWTR Guidance Manual:

a. <u>Step-Dose Method Test</u> -For the step-dose test a constant fluoride dosage of 2.0 mg/L was added to the clear-well inlet. Fluoride levels in the clearwell effluent were monitored and recorded every 3 minutes. The raw tracer study data, along with the results of further analyses are shown in Table C-1.

	Fluoride Concentration				
t, minutes	Measured, mg/L	<u>Tracer, mg/L</u>	Dimensionless, C/C ₀		
0	0.20	0	0		
3	0.20	0	0		
6	0.20	0	0		
9	0.20	0	0		
12	0.29	0.09	0.045		
15	0.67	0.47	0.24		
18	0.94	0.74	0.37		
21	1.04	0.84	0.42		
24	1.44	1.24	0.62		
27	1.55	1.35	0.68		
30	1.52	1.32	0.66		
33	1.73	1.53	0.76		
36	1.93	1.73	0.86		
39	1.85	1.65	0.82		
42	1.92	1.72	0.86		
45	2.02	1.82	0.91		
48	1.97	1.77	0.88		
51	1.84	1.64	0.82		
54	2.06	1.86	0.93		
57	2.05	1.85	0.92		
60	2.10	1.90	0.95		
63	2.14	1.94	0.96		

CLEARWELL DATA-STEP-DOSE TRACER TEST^(1,2,3)

1. Baseline concentration = 0.2 mg/L, fluoride dose = 2.0 mg/L, [C₀ = 2.0 mg/L]

2. Measured concentration = Tracer concentration + Baseline concentration

3. Tracer concentration.= Measured concentration - Baseline concentration

The steps in evaluating the raw data shown in the first column of Table C-1 are as follows. First, the baseline fluoride concentration, 0.2 mg/L, is subtracted from the measured concentration to give the fluoride concentration resulting from the tracer study addition alone. For example, at elapsed time = 39 minutes, the tracer fluoride concentration, C, is obtained as follows:

 $C = C_{measured} - C_{baseline}$ C = 1.85 mg/L - 0.2 mg/LC = 1.65 mg/L

This calculation was repeated at each time interval to obtain the data shown in the third column of Table C-1. As indicated, the fluoride concentration rises from 0 mg/L at t = 0 minutes to the applied fluoride dosage of 2 mg/L, at t = 63 minutes.

The next step is to develop dimensionless concentrations by dividing the tracer concentrations in the second column of Table C-1 by the applied fluoride dosage, Co = 2 mg/L. For time = 39 minutes, C/Co is calculated. as follows:

C/Co = (1.65 mg/L)/(2.0 mg/L) $C/C_0 = 0.82$

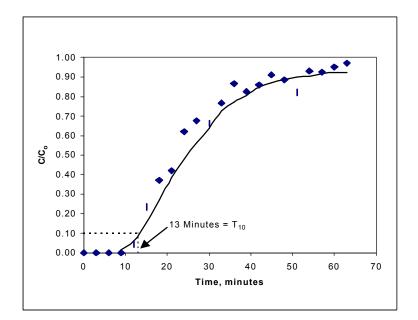
The resulting dimensionless data, presented in the fourth column of Table C-1, is the basis for completing the determination of T_{10} by either the graphical or numerical method.

In order to determine T_{10} by the graphical method, a plot of C/Co vs. time should be generated using the data in Table C-1. A smooth curve should be drawn through the data as shown on Figure C-1.

 T_{10} is read directly from the graph at a dimensionless concentration (C/Co) corresponding to the time for which 10 percent of the tracer has passed at the effluent end of the contact basin (T₁₀). For step-dose method tracer studies, this dimensionless concentration is C/Co = 0.10.

 T_{10} should be read directly from Figure C-1 at C/Co = 0.1 by first drawing a horizontal line (C/Co = 0.1) from the Y-axis (t = 0) to its intersection with the smooth curve drawn through the data. At this point of intersection, the time read from the X-axis is T_{10} and may be found by extending a vertical line downward to the X-axis. These steps were performed as illustrated on Figure C-1, resulting in a value for T_{10} of approximately 13 minutes.

FIGURE C-1 - C/C₀ vs. Time (Graphical Analysis for T_{10})



Chlorine	pH <= 6.5					
Concentration	Log Inactivation					
(mg/L)	0.5	1.0	1.5	2.0	2.5	3.0
<=0.4	20	39	59	78	98	117
0.6	20	40	60	80	100	120
0.8	20	41	61	81	102	122
1	21	42	63	83	104	125
1.2	21	42	64	85	106	127
1.4	22	43	65	87	108	130
1.6	22	44	66	88	110	132
1.8	23	45	68	90	113	135
2	23	46	69	92	115	138
2.2	23	47	70	93	117	140
2.4	24	48	72	95	119	143
2.6	24	49	73	97	122	146
2.8	25	49	74	99	123	148
3	25	50	76	101	126	151

CT Values Tables: CT Values for Inactivation of *Giardia* cysts by Free Chlorine at 5^o C.

Chlorine	pH = 7.0					
Concentration	Log Inactivation					
(mg/L)	0.5	1.0	1.5	2.0	2.5	3.0
<= 0.4	23	46	70	93	116	139
0.6	24	48	72	95	119	143
0.8	24	49	73	97	122	146
1	25	50	75	99	124	149
1.2	25	51	76	101	127	152
1.4	26	52	78	103	129	155
1.6	26	53	79	105	132	158
1.8	27	54	81	108	135	162
2	28	55	83	110	138	165
2.2	28	56	85	113	141	169
2.4	29	57	86	115	143	172
2.6	29	58	88	117	146	175
2.8	30	59	89	119	148	178
3	30	61	91	121	152	182

Chlorine	pH <= 7.5					
Concentration	Log Inactivation					
(mg/L)	0.5	1.0	1.5	2.0	2.5	3.0
<= 0.4	28	55	83	111	138	166
0.6	29	57	86	114	143	171
0.8	29	58	88	117	146	175
1	30	60	90	119	149	179
1.2	31	61	92	122	153	183
1.4	31	62	94	125	156	187
1.6	32	64	96	128	160	192
1.8	33	65	98	131	163	196
2	33	67	100	133	167	200
2.2	34	68	102	136	170	204
2.4	35	70	105	139	174	209
2.6	36	71	107	142	178	213
2.8	36	72	109	145	181	217
3	37	74	111	147	184	221

TRACER STUDY REPORT

Water System Name: _			ID#:		
Water Plant Name:			County:		
Date Tracer Test Perfo	rmed:				
Water Treatment Capa	city (MGD):	Permitted: As Tested:		MGD	
Finished Water Flow (MGD):		Maximum: As Tested:		MGD MGD	
		Clearwell Storage			
No.	Capac (MC	÷	Water Full	Level (ft) As Tested	
Disinfectant applicatio					
Disinfectant Resid pH value : Water temperature Tracer Chemical Selec Background trace	lual : e: ted: r concentration	mg/L	n	ng/L	
Sample location(s) for point):				idual sampling	
Fluoride testing metho	d:				
Sampling intervals:		minute	5		

STEP-DOSE TRACER TEST DATA

Date: _____

Sample No.	Time	Fluoride Cor	Fluoride Concentration (mg/L)			
	(minutes)	Measured	Tracer (C) Measured-baseline	Dimensionless C/C ₀		
<u> </u>						

Remember: C_0 is the tracer (fluoride) concentration used during the test.

11.2.0 <u>CHLORINE TESTING EQUIPMENT</u>

- a. Chlorine residual test equipment recognized in the latest edition of Standard Methods for the Examination of Water and Wastewater shall be provided and should be capable of measuring residuals to the nearest 0.1 milligrams per liter in the range below 0.5 milligrams per liter, to the nearest 0.3 milligrams per liter between 0.5 milligrams per liter and 1.0 milligrams per liter and to the nearest 0.5 milligrams per liter.
- b. Automatic chlorine residual recorders shall be provided for each surface public water system or a ground water source under the direct influence of surface water for continuously monitoring the residual disinfectant concentration of the water entering the distribution system. Exception to this requirement may be made for the smaller systems serving 3,300 or fewer people, as prescribed in the Georgia Rules for Safe Drinking Water, Chapter 391-3-5.

11.2.1 <u>CHLORINATOR PIPING</u>

- a. The chlorinator water supply piping shall be designed to prevent contamination of the treated water supply by sources of questionable quality.
- b. At all facilities treating surface water, pre- and post-chlorination systems must be independent to prevent possible siphoning of partially treated water into the clearwell. A check valve should be provided for the pre-chlorination line near the eductor.
- c. The water supply to each eductor shall have a separate shut-off valve. No master shut-off valve will be allowed.
- d. The pipes carrying elemental liquid or dry gaseous chlorine under pressure must be Schedule 80 seamless steel tubing or other materials recommended by the Chlorine Institute (never use PVC). Rubber, PVC, polyethylene or other materials recommended by the Chlorine Institute must be used for chlorine solution piping and fittings. Nylon products are not acceptable for any part of the chlorine solution piping system.
- 11.2.2 <u>HOUSING FOR CHLORINATION EQUIPMENT</u> Adequate housing must be provided for the chlorination equipment and for storing the chlorine.
 - a. In addition to the applicable items stated in Part 19, "Chemical Application", in this document, the following must be included:
 - 1. Gas chlorination equipment and cylinders must be housed in a separate room or facility provided for that purpose and be separated from the other treatment facilities and chemicals.

Hypochlorite feeders are not required to be placed in a separate room or facility.

- 2. Chlorine cylinders stored or used outdoors must be protected from the direct rays of the sun by shading and additionally protected to prevent unauthorized tampering.
- 3. Chlorine cylinders must be secured from accidental tipping or movement.
- 4. A chlorine gas mask or self contained gas mask (air pack) must be provided outside the gas chlorine room or facility or otherwise made available and be readily accessible to the operator for repairs or emergencies.
- 5. Forced air ventilation, placed near floor level and near the cylinders, must be provided to exhaust any leaking chlorine gas. Exhaust fumes must be directed away from the entrance to the room or facility. The fan must be activated by an outside switch or start automatically when the door is opened.
- 6. A small bottle of fresh ammonia solution shall be provided for testing for chlorine gas leaks.
- 7. There must be sufficient space for chemical storage.
- b. <u>OTHER DISINFECTING AGENTS</u> Proposals for use of disinfecting agents other than chlorine such as iodine or ozone treatment may be approved by the Division prior to preparation of final plans and specifications.

PART 12 - SOFTENING

12.1.0 <u>GENERAL</u> - The softening process selected must be based upon the mineral qualities of the raw water and the desired finished water quality in conjunction with requirements for disposal of sludge or brine waste, cost of plant, cost of chemicals and plant location. Applicability of the process chosen shall be demonstrated.

a. <u>Lime or Lime-Soda Process</u> - For design standards for rapid mix, flocculation and sedimentation, refer to the applicable sections in this document. Additional consideration must be given to the following process elements.

Hydraulics: When split treatment is used, the bypass line should be sized to carry total plant flow, and an accurate means of measuring and splitting the flow must be provided.

- b. <u>Aeration</u> Determinations should be made for the carbon dioxide (CO₂) content of the raw water. When concentrations exceed 10 milligrams per liter, the economics of removal by aeration as opposed to removal with lime should be considered if it has been determined that dissolved oxygen in the finished water will not cause corrosion problems in the distribution system.
- c. <u>Chemical Feed Point</u> Lime and recycled sludge should be fed directly into the rapid mix basin.
- d. <u>Rapid Mix</u> Rapid mix basins must provide not more than 30 seconds detention time with adequate velocity gradients to keep the lime particles dispersed.
- e. <u>Stabilization</u> Equipment for stabilization of water softened by the lime or lime-soda process is required.
- f. <u>Sludge Collection</u> Mechanical sludge removal equipment should be provided in the sedimentation basin. Sludge recycling to the rapid mix should be provided.
- g. <u>Sludge Disposal</u> Provisions must be included for proper disposal of softening sludges.
- h. <u>Disinfection</u> The use of excess lime shall not be considered an acceptable substitute for disinfection.
- i. <u>Plant Start-Up</u> The plant processes must be manually started following shut-down.

- j. <u>Cation Exchange Process</u> Alternative methods of hardness reduction should be investigated when the sodium content and dissolved solids concentration is of concern.
- k. <u>Pre-Treatment Requirements</u> Iron, manganese, or a combination of the two, should not exceed 0.3 milligrams per liter in the water as applied to the ion exchange resin. Pre-treatment is required when the content of iron, manganese or a combination of the two, is one milligram per liter or more. Waters having 5 units or more turbidity should not be applied directly to the cation exhange softener.
- 1. <u>Design</u> The units may be of pressure or gravity type, of either an upflow or downflow design. Automatic regeneration based on volume of water softened should be used unless manual regeneration is justified (suggested for small plants). A manual override shall be provided on all automatic controls.
- m. <u>Exchange Capacity</u> The design capacity for hardness removal should not exceed 20,000 grains per cubic foot when resin is regenerated with 0.3 pounds of salt per kilogram of hardness removed.
- n. <u>Depth of Resin</u> The depth of the exchange resin should not be less than three (3) feet.
- o. <u>Flow Rates</u> The rate of softening should not exceed seven gallons per minute per square foot of bed area (7 gpm/ft²) and the backwash rate should be six to eight gallons per minute per square foot of bed area (6 gpm/ft²). Rate-of-flow controllers or the equivalent must be installed for the above purposes.
- p. <u>Freeboard</u> The freeboard will depend upon the specific gravity of the resin and the direction of water flow. Generally, the washwater collector should be 24 inches above the top of the resin on downflow units.
- q. <u>Underdrains and Supporting Gravel</u> The bottoms, strainer systems and support for the exchange resin shall conform to criteria provided for rapid rate gravity filters. Refer to applicable sections in this document.
- r. <u>Brine Distribution</u> Facilities should be included for even distribution of the brine over the entire surface of both upflow and downflow units.
- s. <u>Cross-Connection Control</u> Backwash, rinse and air relief discharge pipes should be installed in such a manner as to prevent any possibility of back-siphonage.
- t. <u>By-Pass Piping and Equipment</u> A bypass must be provided around softening units to produce a blended water of desirable hardness.

Totalizing meters must be installed on the bypass line and on each softener unit. The bypass line must have a shutoff valve and should have an automatic proportioning or regulating device. In some installations, it may be necessary to treat the bypassed water to obtain acceptable levels of iron and/or manganese in the finished water.

- u. <u>Additional Limitations</u> Silica gel resins should not be used for waters having a pH above 8.4 or containing less than six milligrams per liter silica and should not be used when iron is present. When the applied water contains a chlorine residual, the cation exchange resin shall be a type that is not damaged by residual chlorine. Phenolic resin should not be used.
- v. <u>Sampling Taps</u> Smooth-nose sampling taps must be provided for the collection of representative samples. The taps shall be located to provide for sampling of the softener influent, effluent and blended water. The sampling taps for the blended water shall be at least 20 feet downstream from the point of blending. Petcocks are not acceptable as sampling taps. Sampling taps should be provided on the brine tank discharge piping.

12.1.1 BRINE AND SALT STORAGE TANKS

- a. Salt dissolving or brine tanks and wet salt storage tanks must be covered and must be corrosion-resistant.
- b. The make-up water inlet must be protected from back-siphonage. Water for filling the tank should be distributed over the entire surface by pipes above the maximum brine level in the tank. The tanks should be provided with an automatic declining level control system on the make-up water line.
- c. Wet salt storage basins must be equipped with manholes or hatchways for access and for direct dumping of salt from truck or railcar. Openings must be provided with raised curbs and watertight covers having overlapping edges similar to those required for finished water reservoirs.
- d. Overflows, where provided, must be protected with corrosion resistant screens and must terminate with either a turned down bend having a proper free fall discharge or a self-closing flap valve.
- e. Two wet salt storage tanks or compartments designed to operate independently should be provided.
- f. The salt shall be supported on graduated layers of gravel placed over a brine collection system.

g. Alternative designs which are conducive to frequent cleaning of the wet salt storage tank may be considered.

12.1.2 <u>SALT AND BRINE STORAGE CAPACITY</u> - Total salt storage should have sufficient capacity to store in excess of 1-1/2 carloads or truckloads of salt, and provide for at least 30 days of operation.

12.1.3 <u>BRINE PUMP OR EDUCTOR</u> - An eductor may be used to transfer brine from the brine tank to the softeners. If a pump is used, a brine measuring tank or means of metering should be provided to obtain proper dilution.

12.1.4 <u>STABILIZATION</u> - Stabilization for corrosion control shall be provided.

12.1.5 <u>WASTE DISPOSAL</u> - Acceptable disposal must be provided for the brine waste. Where the volume of spent brine must be reduced, consideration may be given to using a part of the spent brine for a subsequent regeneration.

12.1.6 <u>CONSTRUCTION MATERIALS</u> - Pipes and contact materials must be resistant to the aggressiveness of salt. Plastic and red brass are acceptable piping materials. Steel and concrete must be coated with a non-leaching protective coating which is compatible with salt and brine.

12.1.7 <u>HOUSING</u> - Bagged salt and dry bulk salt storage shall be enclosed and separated from other operating areas in order to prevent damage to equipment.

PART 13 - AERATION

13.1.0 <u>GENERAL</u> - Aeration may be used to help remove offensive tastes and odors due to dissolved gases from decomposing organic matter, or to reduce or remove objectionable amounts of carbon dioxide, hydrogen sulfide, etc., and to introduce oxygen to assist in iron and/or manganese removal. The packed tower aeration process is an aeration process applicable to removal of volatile organic contaminants.

- a. A by-pass shall be provided for all aeration units.
- b. The aggressiveness of the water after aeration should be determined and corrected by additional treatment, if necessary.

13.1.1 <u>NATURAL DRAFT AERATION</u> - Design shall provide:

- a. perforations in the distribution pan 3/16 to 1/2 inches in diameter, spaced 1 to 3 inches on centers to maintain a six inch water depth;
- b. for distribution of water uniformly over the top tray;
- c. discharge through a series of three or more trays with separation of trays not less than 12 inches;
- d. loading at a rate of 1 to 5 gallons per minute for each square foot of total tray area;
- e. trays with slotted, heavy wire (1/2 inch openings) mesh or perforated bottoms;
- f. construction of durable material resistant to aggressiveness of the water and dissolved gases;
- g. protection from loss of spray water by wind carriage by enclosure with louvers sloped to the inside at a angle of approximately 45 degrees;
- h. protection from insects by 24-mesh screen;
- i. aerated water receives disinfection treatment.

13.1.2 FORCED OR INDUCED DRAFT AERATION - Devices shall be designed to:

a. include a blower with a weatherproof motor in a tight housing and screened enclosure;

- b. insure adequate counter current of air through the enclosed aerator column;
- c. exhaust air directly to the outside atmosphere;
- d. include a down-turned and 24-mesh screened air outlet and inlet;
- e. be such that air introduced in the column shall be as free from obnoxious fumes, dust and dirt as possible;
- f. be such that sections of the aerator can be easily reached or removed for maintenance of the interior or installed in a separate aerator room;
- g. provide loading at a rate of 1 to 5 gallons per minute for each square foot of total tray area;
- h. insure that the water outlet is adequately sealed to prevent unwarranted loss of air;
- i. discharge through a series of five or more trays with separation of trays not less than six inches;
- j. provide distribution of water uniformly over the top tray;
- k. be of durable material resistant to the aggressiveness of the water and dissolved gases.

13.1.3 <u>PRESSURE AERATION</u>: Pressure aeration may be used for oxidation purposes only if pilot plant study indicates the method is applicable. It is not acceptable for removal of dissolved gases. Filters following pressure aeration must have adequate exhaust devices for release of air. Pressure aeration devices shall be designed to:

- a. give thorough mixing of compressed air with water being treated;
- b. provide screened and filtered air, free of obnoxious fumes, dust, dirt and other contaminants.

13.1.4 <u>PACKED TOWER AERATION</u> - Packed tower aeration (PTA) which is also known as air stripping involves passing water down through a column of packing material while pumping air counter-currently up through the packing. PTA is used for the removal of volatile organic chemicals, trihalomethanes, carbon dioxide and radon. Generally, PTA is feasible for compounds with a Henry's Constant greater than 100 (expressed in atm mol/mol) at 12^{0} C), but not normally feasible for removing compounds with a Henry's Constant less than 10. For values between 10 and 100, PTA may be feasible but should be extensively evaluated using pilot studies.

13.1.4.1 Process Design

- Process design methods for PTA involve the determination of Henry's a. Constant for the contaminant, the mass transfer coefficient, air pressure drop and stripping factor. The project shall provide justification for the design parameters selected (i.e. height and diameter of unit, air to water ratio, packing depth, surface loading rate, etc.). Pilot plant testing shall be provided. The pilot test shall evaluate a variety of loading rates and air to water ratios at the peak contaminant concentration. Special consideration should be given to removal efficiencies when multiple contaminations occur. Where there is considerable past performance data on the contaminant to be treated and there is a concentration level similar to previous projects, the Division may consider approval of the process design based on use of appropriate calculations without pilot testing. The proposals of this type must be discussed with the Division prior to preparation of the design plans and specifications.
- b. The tower shall be designed to reduce contaminants to below the maximum contaminant level (MCL) and to the lowest practical level.
- c. The ratio of the column diameter to packing diameter should be at least 7:1 for the pilot unit and at least 10:1 for the full scale tower. The type and size of the packing used in the full scale unit shall be the same as that used in the pilot work.
- d. The minimum volumetric air to water ratio at peak water flow should be 25:1. The maximum air to water ratio for which credit will be given is 80:1.
- e. The design should consider potential fouling problems from calcium carbonate and iron precipitation and from bacterial growth. It may be necessary to provide pretreatment.
- f. Disinfection capability shall be provided prior to and after PTA.
- g. The effects of temperature should be considered since a drop in water temperature can result in a drop in contaminant removal efficiency.

13.1.4.2 <u>Materials of Construction</u> - The tower can be constructed of stainless steel, concrete, aluminum, fiberglass or plastic. Uncoated carbon steel is not recommended because of corrosion. Towers constructed of light-weight materials should be provided with adequate support to prevent damage from wind. Packing materials shall be resistant to the aggressiveness of the water, dissolved gases and cleaning materials and shall be suitable for contact with potable water.

13.1.4.3 <u>Water Flow</u> - Water should be distributed uniformly at the top of the tower using spray nozzles or orifice-type distributor trays that prevent short-circuiting. In addition,

- a. A mist eliminator shall be provided above the water distributor system.
- b. A side wiper-redistribution ring should be provided at least every 10 feet in order to prevent water channeling along the tower wall and short circuiting.
- c. Sample taps shall be provided in the influent and effluent piping.
- d. The effluent sump, if provided, shall have easy access for cleaning purposes and be equipped with a drain valve. The drain shall not be connected directly to any storm or sanitary sewer.
- e. A blow-off line should be provided in the effluent piping to allow for discharge of water/chemicals used to clean the tower.
- f. The design shall prevent freezing of the influent riser and effluent piping when the unit is not operating. If piping is buried, it shall be maintained under positive pressure.
- g. The water flow to each tower shall be metered.
- h. An overflow line shall be provided which discharges 12 to 14 inches above a splash pad or drainage inlet. Proper drainage shall be provided to prevent flooding of the area.

13.1.4.4 Air Flow System

- a. The air inlet to the blower and tower discharge vent shall be protected with a noncorrodible 24-mesh downturned screen to prevent contamination from extraneous matter.
- b. The air inlet shall be in a protected location.
- c. An air flow meter shall be provided on the influent air line or an alternative method to determine the air flow shall be provided.
- d. A backup motor for the air blower must be readily available.

13.1.4.5 Other Features to be Provided

- a. A sufficient number of access ports with a minimum diameter of 24 inches to facilitate inspection, media replacement, media cleaning and maintenance of the interior.
- b. A method of cleaning the packing material when iron, manganese or calcium carbonate fouling may occur.
- c. Tower effluent collection and pumping wells constructed to clearwell standards.
- d. Provisions for extending the tower height without major reconstruction.
- e. An acceptable alternative supply must be available during periods of maintenance and operation interruptions. No bypass shall be provided unless specifically approved by the Division.
- f. Disinfection application points both ahead of and after the tower to control biological growth.
- g. Disinfection and adequate contact time after the water has passed through the tower and prior to the distribution system.
- h. Adequate packing support to allow free flow of water and to prevent deformation with deep packing heights.
- i. Operation of the blower and disinfectant feeder equipment during power failures.
- j. Adequate foundation to support the tower and lateral support to prevent overturning due to wind loading.
- k. Fencing and locking gate to prevent vandalism.
- 1. An access ladder with safety cage for inspection of the aerator including the exhaust port and de-mister.
- m. Electrical interconnection between blower, disinfectant feeder and well pump.

13.1.4.6 Environmental Factors

a. The applicant must contact the Division's Air Quality Branch to determine if permits are required under the Clean Air Act.

b. Noise control facilities should be provided on PTA systems located in residential areas.

13.1.4.7 <u>Other Methods of Aeration</u> - Other methods of aeration may be used if applicable to the treatment needs. Such methods include but are not restricted to spraying, diffused air, cascades and mechanical aeration. The treatment processes must be designed to meet the particular needs of the water to be treated and are subject to the approval of the Division.

13.1.4.8 <u>Protection of Aerators from Contamination</u> - All aerators except those discharging to lime softening or clarification plants shall be protected from contamination by birds, insects, wind borne debris, rainfall and water draining off the exterior of the aerators.

13.1.4.9 <u>Disinfection</u> - Groundwater supplies exposed to the atmosphere by aeration must receive disinfection treatment as the minimum additional treatment.

13.1.4.10 <u>By-Pass</u> - A by-pass shall be provided for all aeration units.

13.1.4.11 <u>Corrosion Control</u> - The aggressiveness of the water after aeration should be determined and corrected by additional treatment, if necessary.

PART 14 - IRON AND MANGANESE CONTROL TREATMENT

14.1.0 <u>GENERAL</u> - Iron and manganese control, as used herein, refers solely to treatment processes designed specifically for this purpose. The treatment process used will depend upon the character of the raw water. The selection of one or more treatment processes must meet specific local conditions as determined b engineering investigations, including chemical analyses of representative samples of water to be treated, and receive the approval of the Division. It may be necessary to operate a pilot plant in order to gather all information pertinent to the design. Consideration should be given to adjusting pH of the raw water to optimize the chemical reaction. Testing equipment and sampling taps shall be provided as outlined in this document.

14.1.1 <u>REMOVAL BY OXIDATION, DETENTION AND FILTRATION</u>

- a. <u>Oxidation</u> Oxidation may be by aeration, as outlined in this document, or by chemical oxidation with chlorine, potassium permanganate, ozone or chlorine dioxide.
- b. <u>Detention</u> A detention time of at least 20 minutes shall be provided following aeration to insure that the oxidation reactions are as complete as possible. This minimum detention may be omitted only where a pilot plant study indicates no need for detention. The detention basin should be designed as a holding tank with no provisions for sludge collection but with sufficient baffling to prevent short-circuiting. Sedimentation basins shall be provided when treating water with high iron and/or manganese content, or where chemical coagulation is used to reduce the load on the filters. Provisions for sludge removal shall be made.
- c. <u>Filtration</u> Filters shall be provided and shall be in conformance with this document. Filtration rate normally should not exceed 3 gpm/ft^2 of filter area.

14.1.2 <u>REMOVAL BY THE LIME-SODA SOFTENING PROCESS</u> - See applicable Section in this document.

14.1.3 <u>REMOVAL BY MANGANESE GREENSAND FILTRATION</u> - This process, consists of a continuous feed of potassium permanganate to the influent of a manganese greensand filter.

- a. The permanganate should be applied as far ahead of the filter as practical.
- b. Other oxidizing agents or processes such as chlorination or aeration may be used prior to the permanganate feed to reduce the cost of the chemical.
- c. Anthracite media cap of at least six inches shall be provided over manganese treated greensand.

- d. Normal filtration rate is 3 gpm/ft^2 of filter area.
- e. Normal wash rate is 8 to 10 gpm/ft^2 .
- f. Air washing should be provided.
- g. Sample taps shall be provided at the following locations:
 - 1. prior to application of permanganate;
 - 2. immediately ahead of filtration;
 - 3. at points between the anthracite media and the manganese treated greensand media;
 - 4. halfway down the manganese treated greensand media;
 - 5. at the filter effluent.

14.1.4 <u>REMOVAL BY ION EXCHANGE</u> - This process of iron and manganese removal should not be used for water containing more than 0.3 milligrams per liter of iron, manganese or combination thereof. This process is not acceptable where either the raw water or wash water contains dissolved oxygen.

14.1.5 <u>SEQUESTRATION BY POLYPHOSPHATES</u> - This process is generally suitable only for low contents of iron and manganese where iron, manganese or combination thereof does not exceed 1.0 milligrams per liter. The total phosphate applied should not exceed 10 milligrams per liter as PO_4 or as recommended by the product supplier in accordance with the NSF Standard 60 listing. Where phosphate treatment is used, satisfactory chlorine residuals shall be maintained in the distribution system. In addition, a systematic flushing program shall be established and maintained for the distribution system.

- a. Feeding equipment shall be as outlined in this document.
- b. Stock phosphate solution must be kept covered and disinfected by carrying approximately 10 milligrams per liter free chlorine residual.
- c. Polyphosphates shall not be applied ahead of iron and manganese removal treatment. The point of application shall be prior to any aeration, oxidation or disinfection if no iron or manganese removal treatment is provided.
- d. Phosphate compounds used must be certified for conformance with NSF Standard 60.

14.1.6 <u>SEQUESTRATION BY SODIUM SILICATES</u> - Sodium silicate sequestration of iron and manganese is appropriate only for groundwater supplies prior to air contact. On-site pilot tests are required to determine the suitability of sodium silicate for the particular water and the minimum feed needed. Rapid oxidation of the metal ions such as by chlorine or chlorine dioxide must accompany or closely precede the sodium silicate addition. Injection of sodium silicate more than 15 seconds after oxidation may cause detectable loss of chemical efficiency. Dilution of feed solutions much below five percent (5%) silica as SiO₂ should also be avoided for the same reason.

- a. Sodium silicate addition is applicable to waters containing up to 2 mg/l of iron, manganese or combination thereof.
- b. Chlorine residuals shall be maintained throughout the distribution system to prevent biological breakdown of the sequestered iron.
- c. The amount of silicate added shall be limited to 20 mg/l as SiO_2 but the amount of added and naturally occurring silicate shall not exceed 60 mg/l as SiO_2 .
- d. Feeding equipment shall be as outlined in this document.
- e. Sodium silicate shall not be applied ahead of iron or manganese removal treatment.
- f. Liquid sodium silicate must be certified for conformance with NSF Standard 60.

14.1.7 <u>Sampling Taps</u> - Smooth-nosed sampling taps shall be provided for control purposes. Taps shall be located on each raw water source, each treatment unit influent and each treatment unit effluent.

14.1.8 <u>Testing Equipment</u> - Testing equipment shall be provided for all plants. The equipment should have the capacity to accurately measure the iron content to a minimum of 0.1 milligrams per liter and the manganese content to a minimum of 0.05 milligrams per liter. Where polyphosphate sequestration is practiced, appropriate phosphate testing equipment shall be provided.

PART 15 - FLUORIDATION

15.1.0 <u>GENERAL</u> - Sodium fluoride, sodium silicofluoride and hydrofluosilicic acid shall conform to the applicable AWWA standards. Other fluoride compounds which may be available must be approved by the Division.

15.1.1 FLUORIDE COMPOUND STORAGE

- a. Fluoride chemicals should be isolated from other chemicals to prevent contamination.
- b. Compounds shall be stored in covered or unopened shipping containers and should be stored inside a building.
- c. Bulk storage units and day tanks, drums in use and unsealed storage units for hydrofluosilicic acid should be vented to the atmosphere at a point outside any building.
- d. Bags, fiber drums and steel drums should be stored on pallets.

15.1.2 CHEMICAL FEED EQUIPMENT AND INSTALLATIONS

15.1.2.1 <u>GENERAL</u> - In addition to the requirements listed under "Chemical Application" in this document, the fluoride feed equipment shall meet the following requirements:

- a. shall provide scales, loss-of-weight recorders or liquid level indicators, as appropriate for dry or acid chemical feeds. Dry volumetric feeders are to have percent-of cycle timer or variable speed drive. A minimum of 35-gallon dissolver with mechanical mixer.
- b. feeders shall be accurate to within 5 % of any desired feed rate;
- c. fluoride compound shall not be added before lime-soda softening or ion exchange softening;
- d. the point of application of hydrofluosilicic acid, if into a horizontal pipe, shall be in the lower half of the pipe;
- e. a fluoride solution shall be applied by a positive displacement pump having a stroke rate not less than 20 strokes per minute;

- f. anti-siphon devices shall be provided for all fluoride feed lines and dilution water lines;
- g. a device to measure the flow of water to be treated is required;
- h. the dilution water pipe shall terminate at least two pipe diameters above the solution tank;
- i. water used for sodium fluoride dissolution shall be softened if hardness exceeds 75 mg/l as calcium carbonate;
- j. fluoride solutions shall not be injected to a point of negative pressure;
- k. the electrical outlet used for the fluoride feed pump should have a nonstandard receptacle and shall be interconnected with the well or service pump;
- 1. saturators should be of the upflow type and be provided with a meter and backflow protection on the makeup water line.

15.1.3 <u>PROTECTIVE EQUIPMENT</u> - Protective equipment, as outlined in Part 19, titled "Chemical Application" shall be provided for operators handling fluoride compounds.

15.1.4 DUST CONTROL

- a. Provision shall be made for the transfer of dry fluoride compounds from shipping containers to storage bins or hoppers in such a way as to minimize the quantity of fluoride dust which may enter the room in which the equipment is installed.
- b. The enclosure shall be provided with an exhaust fan and dust filter which place the hopper under a negative pressure. Air exhausted from fluoride handling equipment shall discharge through a dust filter to the outside atmosphere of the building.
- c. The disposal of empty bags, drums or barrels shall be in a manner to minimize exposure to fluoride dusts.
- d. A floor drain should be provided to facilitate the hosing of floors.

15.1.5 <u>TESTING EQUIPMENT</u> - Equipment shall be provided for measuring the quantity of fluoride in the water. Such equipment shall be acceptable to the Division.

PART 16 - CORROSION CONTROL

16.1.0 <u>GENERAL</u> - To control corrosion, certain basic approaches can be utilized:

- a. Using pipe materials and designing the system so it is not corroded by a given water;
- b. Modifying the water quality so it is not corrosive to the pipe material;
- c. Placing a protective barrier or lining between the water and the pipe.

16.1.1 SYSTEM DESIGN

- a. Choose compatible materials throughout the system where possible to avoid forming galvanic cells;
- b. Avoid dead ends and stagnant areas;
- c. Reduce mechanical stress, sharp turns and elbows;
- d. Provide adequate insulation and avoid uneven heat distribution;
- e. Eliminate grounding of electrical circuits to system.

16.1.2 <u>CATHODIC PROTECTION</u> - Metal tanks and reservoirs should be considered for protection from corrosion by this method.

16.1.3 <u>MODIFICATION OF WATER QUALITY</u> - pH adjustment by the addition of lime, caustic soda or soda ash in order to stabilize the water with regard to calcium carbonate. Advantages of aeration for iron, H_2S or CO_2 removal should be balanced against the fact that dissolved oxygen is a corrosive agent.

16.1.4 <u>USE OF INHIBITORS</u> - These may be used as appropriate.

- a. Addition of lime or alkalinity increases the tendency of water to deposit CaCO₃ forming a protective coating inside of pipe.
- b. A phosphate compound which not only masks the symptoms of red water due to iron, but also reduces corrosion can be selected.

c. Sodium silicate can be effective in water with low hardness, alkalinity, and pH less than 8.4 under relatively high velocity conditions.

16.1.5 <u>COATINGS AND LININGS</u> – Metal distribution system components' surfaces in contact with water shall be protected by being coated or lined. Coatings and linings used must be certified for conformance with NSF Standard 61.

16.1.6 <u>WATER UNSTABLE DUE TO BIOCHEMICAL ACTION IN DISTRIBUTION</u> <u>SYSTEM</u> - Unstable water resulting from the bacterial decomposition of organic matter in water (especially in dead end mains), the biochemical action within tubercles and the reduction of sulfates to sulfides should be prevented by the maintenance of a free chlorine residual throughout the distribution system.

PART 17 - TASTE AND ODOR CONTROL

17.1.0 <u>GENERAL</u>

- a. Provision shall be made for the control of taste and odor at all water treatment plants.
- b. Chemicals shall be added sufficiently ahead of other treatment processes to assure adequate contact time for an effective and economical use of the chemicals.
- c. Where severe taste and odor problems are encountered, in-plant and/or pilot plant studies may be required.

17.1.1 <u>FLEXIBILITY</u> - Plants treating water that is known to have taste and odor problems should be provided with equipment that makes several of the control processes available so that the operator will have flexibility in operation.

17.1.2 <u>CHLORINATION</u> - Chlorination can be used for the removal of some objectionable odors. Adequate contact time must be provided to complete the chemical reactions involved. Excessive potential trihalomethane production through this process should be avoided by adequate bench-scale testing prior to design.

17.1.3 <u>CHLORINE DIOXIDE</u> - Chlorine dioxide has been generally recognized as a treatment for tastes caused by industrial wastes, such as phenols. However, chlorine dioxide can be used in the treatment of any taste and odor that is treatable by an oxidizing compound. Provisions shall be made for proper storing and handling of the sodium chlorite, so as to eliminate any danger of explosion.

17.1.4 POWDERED ACTIVATED CARBON

- a. Powdered activated carbon should be added as early as possible in the treatment process to provide maximum contact time. Flexibility to allow the addition of carbon at several points is preferred. Activated carbon should not be applied near the point of chlorine application.
- b. The carbon can be added as a pre-mixed slurry or by means of a dry-feed machine as long as the carbon is properly "wetted".
- c. Continuous agitation is necessary to keep the carbon from depositing in the mixing tank.

- d. Provision shall be made for adequate dust control.
- e. The required rate of feed of carbon in a water treatment plant depends upon the tastes and/or odors involved, but provision should be made for adding from 0.1 mg/L to at least 40 mg/L.
- f. Powdered activated carbon shall be handled as a potentially combustible material. It should be stored in a building or compartment as nearly fireproof as possible. Other chemicals should not be stored in the same compartment. A separate room should be provided for carbon feed installations. Carbon feeder rooms should be equipped with explosion-proof electrical outlets, lights and motors.

17.1.5 <u>GRANULAR ACTIVATED CARBON</u> - See Section under "Filters" for application within filters. Rates of flow shall be consistent with the type and intensity of the problem. The design used must be supported by the results of pilot plant studies when granular activated carbon units are used for organic removal.

17.1.6 <u>COPPER SULFATE AND OTHER COPPER COMPOUNDS</u> - Continuous or periodic treatment of water supplies with copper compounds to kill algae or other growths shall be controlled to prevent copper in excess of 1.0 milligrams per liter as copper in the plant effluent or distribution system. Care shall be taken to assure an even distribution and to prevent fish kills. A dose at 0.9 lb/acre-foot may be considered for waters with alkalinity less than 50 mg/L, and 5.4 lb/acre-foot if alkalinity is greater than 50 mg/L.

17.1.7 <u>AERATION</u> - See appropriate section in this document.

17.1.8 <u>POTASSIUM PERMANGANATE</u> - Application of potassium permanganate may be considered, providing the treatment shall be designed so that the products of the reaction are not visible in the finished water. It must be applied as early in the treatment as possible to provide adequate contact time and must be prior to filtration.

17.1.9 <u>OZONE</u> - Ozonation can be used as a means of taste and odor control. Adequate contact time must be provided to complete the chemical reactions involved. Ozone is generally more desirable for treating water with high threshold odors.

17.1.10 <u>OTHER METHODS</u> - The decision to use any other methods of taste and odor control should be made only after careful laboratory and/or pilot plant tests and on consultation with the Division.

PART 18 - WASTE HANDLING AND DISPOSAL

18.1.0 <u>GENERAL</u> - Provisions must be made for proper disposal of water treatment plant waste such as sanitary, laboratory, clarification sludge, softening sludge, iron sludge, filter backwash water and brines. All waste discharges shall be governed by Georgia EPD requirements. In locating waste disposal facilities, due consideration shall be given to preventing potential contamination of the water supply. The quantity of waste produced shall be minimized by choice of treatment processes and chemicals. Although not recommended, if supernatant water from backwash/sludge holding tanks or lagoons is to be recycled through the treatment plant, potential impacts on the treatment process must be considered. Provision of appropriate treatment shall be considered to reduce contaminants that may be concentrated in sludges and backwash water.

18.1.1 <u>SANITARY WASTE</u> - The sanitary waste from water treatment plants, pumping stations, and other waterworks installations must receive treatment. Waste from these facilities must be discharged directly to a sanitary sewer system, when available and feasible, or to an adequate on-site waste disposal facility providing suitable treatment.

18.1.2 <u>BRINE WASTE</u> - The disposal method proposed must receive prior approval from the Division.

18.1.3 <u>LIME SOFTENING SLUDGE</u> - Methods of treatment and disposal of sludge from plants using lime are as follows:

- a. <u>Lagoons</u> Design should provide:
 - 1. Temporary lagoons which must be cleaned periodically should be designed on the basis of 0.7 acres per million gallons per day per 100 milligrams per liter of hardness removed based on a usable lagoon depth of 5 feet. This should provide about 2-1/2 years storage. At least two but preferably more lagoons must be provided in order to give flexibility in operation. An acceptable means of final sludge disposal must be provided. Provisions must be made for convenient cleaning.
 - 2. Permanent lagoons should have a volume of at least 4 times that for temporary lagoons.
 - 3. The design of both temporary lagoons and permanent lagoons should provide for:
 - (A) location free from flooding;

- (B) when necessary, dikes, deflecting gutters or other means of diverting surface water so that it does not flow into the lagoons;
- (C) a minimum usable depth of 5 feet;
- (D) adequate freeboard of at least 2 feet;
- (E) adjustable decanting devices;
- (F) effluent sampling point;
- (G) adequate safety provisions; and
- (H) parallel operation.
- b. The application of liquid lime sludge to farm land may be considered as a method of disposal with the prior approval of the Division.
- c. Discharge of lime sludge to sanitary sewers should be avoided since it may cause both liquid volume and sludge volume problems at the sewage treatment plant. This method should be used only when the sewerage system has the capability to adequately handle the lime sludge.
- d. Mixing of lime sludge with activated sludge waste may be considered as a means of co-disposal.
- e. Disposal at a landfill can be done as either a solid or liquid if the landfill can accept such waste, in conformance with the Division requirements.
- f. Mechanical dewatering of sludge may be considered. Pilot studies on a particular plant waste are required.
- g. Calcination of sludge may be considered. Pilot studies on a particular plant waste are required.
- h. Lime sludge drying beds are not recommended.

18.1.4 <u>ALUM SLUDGE</u>

18.1.4.1 <u>GENERAL</u>

a. Lagooning may be used as a method of handling alum sludge. Lagoon size can be calculated using total chemicals used plus a factor for turbidity.

- b. Mechanical concentration may be considered. A pilot plant study is required before the design of a mechanical dewatering installation.
- c. Freezing changes the nature of alum sludge so that it can be used for fill. Acid treatment of sludge for alum_recovery may be a possible alternative.
- d. Alum sludge can be discharged to a sanitary sewer. However, initiation of this practice will depend on obtaining approval from the owner of the sewerage system as well as from the Division before final designs are made.
- e. Lagoons should be designed to produce an effluent satisfactory to the Division and should provide for:
 - 1. location free from flooding;
 - 2. where necessary, dikes, deflecting gutters or other means of diverting surface water so that it does not flow into the lagoon;
 - 3. a minimum usable depth of 5 feet;
 - 4. adequate freeboard of at least 2 feet;
 - 5. adjustable decanting device;
 - 6. effluent sampling point; and
 - 7. adequate safety provisions.

18.1.5 <u>"RED WATER" WASTE</u> - Waste filter wash water from iron and manganese removal plants can be disposed of as follows:

- a. <u>SAND FILTERS</u> Sand filters should have the following features:
 - 1. Total filter area, regardless of the volume of water to be handled, should be no less than 100 square feet. Unless the filter is small enough to be cleaned and returned to service in one day, two or more cells are required.
 - 2. The "red water" filter shall have sufficient capacity to contain, above the level of the sand, the entire volume of wash water produced by washing all of the production filters in the plant, unless the production filters are washed on a rotating schedule and the flow through the production filters is regulated by true rate of flow controllers. Then sufficient volume must be provided to properly dispose of the wash water involved.

- 3. Sufficient filter surface area should be provided so that, during any one filtration cycle, no more than 2 feet of backwash water will accumulate over the sand surface.
- 4. The filter shall not be subject to flooding by surface runoff or flood waters. Finished grade elevation shall be established to facilitate maintenance, cleaning and removal of surface sand as required. Flash boards or other non-watertight devices shall not be used in the construction of filter side walls.
- 5. The filter media should consist of a minimum of 12 inches of sand, 3 to 4 inches of supporting small gravel or torpedo sand, and 9 inches of gravel in graded layers. All sand and gravel should be washed to remove fines.
- 6. Filter sand should have an effective size of 0.3 to 0.5 mm and a uniformity coefficient not to exceed 3.5. The use of larger sized sands shall be justified by the designing engineer to the satisfaction of the Division.
- 7. The filter should be provided with an adequate under-drainage collection system to permit satisfactory discharge of filtrate.
- 8. Provision shall be made for the sampling of the filter effluent.
- 9. Overflow devices from "red water" filters shall not be allowed.
- 10. Where freezing is a problem, provisions should be made for covering the filters during the winter months.
- 11. "Red water" filters shall comply with the common wall provisions contained in this document, which pertain to the possibility of contaminating treated water with an unsafe water.
- b. <u>LAGOONS</u> Lagoons shall have the following features:
 - 1. be designed with a volume 10 times the total quantity of wash water discharged during any 24-hour period;
 - 2. a minimum usable depth of 3 feet;
 - 3. length 4 times width, and the width at least 3 times the depth, as measured at the operating water level;
 - 4. outlet to be at the end opposite the inlet;
 - 5. a weir overflow device at the outlet end with weir length equal to or greater than depth;

6. velocity to be dissipated at the inlet end.

c. <u>DISCHARGE TO COMMUNITY SANITARY SEWER</u> - Red water can be discharged to a community sewer. However, approval of this method will depend on obtaining approval from the owner of the sewerage system as well as from the Division before final designs are made. A holding tank is recommended to prevent overloading the sewers.

d. <u>RECYCLING "RED WATER" WASTES</u> - Recycling of supernatant or filtrate from "red water" waste treatment facilities to the head end of an iron removal plant shall not be allowed.

e. WASTE FILTER WASH WATER

- 1. Waste filter wash water from surface water treatment or lime softening plants should have suspended solids reduced to a level acceptable to the Division in accordance with the issued NPDES permit, before being discharged.
- 2. The plants should construct appropriate holding tanks or other facilities for this purpose. The holding tank should be of such a size that it will contain the anticipated volume of waste wash water produced by the plant when operating at design capacity.
- 3. A plant that has two filters should have a holding tank that will contain the total waste wash water from both filters calculated by using a 15 minute wash at 20 gpm/ft². In plants with more filters, the size of the holding tank will depend on the anticipated hours of operation.
- 4. Filter backwash water should not be recycled when the raw water contains excessive algae, when finished water taste and odor problems are encountered, or when trihalomethane levels in the distribution system may exceed allowable levels.

PART 19 - CHEMICAL APPLICATION

19.1.0 <u>GENERAL</u> - All chemicals that come into contact with the drinking water during its treatment shall be certified for conformance with the NSF Standard 60.

19.1.1 <u>DESCRIPTION</u>: Plans and specifications describing the water treatment plants (new, modified or expanded) shall include the chemicals and chemical feed equipment to be used in the treatment process. Plans and Specifications shall include:

- a. descriptions of feed equipment, including maximum and minimum feed ranges;
- b. location of feeders, piping layout and points of application;
- c. storage and handling facilities;
- d. specifications for chemicals to be used;
- e. operating and control procedures including proposed application rates; and
- f. descriptions of testing equipment and procedures.

19.1.2 <u>CHEMICAL APPLICATION</u> - Chemicals shall be applied to the water at such points and by such means as to:

- a. assure maximum efficiency of treatment and good mixing of the chemicals with the water;
- b. assure maximum safety to consumer and the operators;
- c. provide maximum flexibility of operation through various points of application, when appropriate; and,
- d. prevent backflow or back-siphonage at all feed points.

19.1.3 FEED EQUIPMENT

- a. <u>Number of Feeders</u>: Where chemical feed is essential for the production of safe drinking water, or necessary for continuous operation and for the protection of the water supply:
 - 1. a minimum of two feeders shall be provided;

- 2. a standby unit or a combination of units of sufficient capacity should be available to replace the largest unit during shut-downs;
- 3. where a booster pump is required, duplicate equipment should be provided and, when necessary, a standby power.
- b. <u>Additional Considerations</u>: A separate feeder must be used for each chemical applied. In addition, spare parts should be available for all feeders to replace parts which are subject to wear and damage.

19.1.4 <u>GENERAL EQUIPMENT DESIGN AND CAPACITY</u> - General equipment design shall be such that:

- a. feeders will be able to supply, at all times, the necessary amounts of chemicals at an accurate rate, throughout the range of feed;
- b. feeders are adjustable to handle all plant flow rates;
- c. chemical-contact materials and surfaces are resistant to the aggressiveness of the chemical solution;
- d. corrosive chemicals are introduced in such a manner as to minimize potential for corrosion;
- e. chemicals that are incompatible are not stored or handled together;
- f. all chemicals are conducted from the feeder to the point of application in separate conduits;
- g. chemical feeders are as near as practical to the feed point;
- h. positive displacement type solution feed pumps shall be used to feed liquid chemicals, and shall not be used to feed chemical slurries;
- i. chemicals are fed by gravity where practical, and shall not be siphoned into the water supply;
- j. service water supply shall be protected from contamination by the chemical solutions. It should be equipped with backflow prevention devices or an air gap should be provided between the supply line and the solution tank;
- k. no direct connection shall exist between any sewer and a drain or overflow from the feeder or solution chamber or tank. All drains shall terminate at least six inches or two pipe diameters, whichever is greater, above the overflow rim of a receiving sump, conduit or waste receptacle.
- 1. Dry Chemical Feeders shall:

- (A) measure chemicals volumetrically or gravimetrically;
- (B) provide adequate solution water and agitation of the chemical in the solution pot;
- (C) provide gravity feed from solution pots; and,
- (D) completely enclose chemicals to prevent emission of dust to any of the operating areas.
- m. Positive Displacement Solution Pumps shall be used to feed liquid chemicals, but shall not be used to feed chemical slurries. Pumps must be sized to match or exceed maximum head conditions found at the point of injection.
- n. Liquid Chemical Feeders shall be such that chemical solutions cannot be siphoned into the water supply, by assuring discharge at a point of positive pressure, or providing vacuum relief, or providing a suitable air gap, or other suitable means or combinations as necessary.

19.1.5 <u>LOCATION OF CHEMICAL FEED EQUIPMENT</u> - Chemical feed equipment shall:

- a. be located in a separate room to reduce hazards and dust problems;
- b. be conveniently located near points of application to minimize length of feed lines;
- c. be readily accessible for servicing, repair, calibration and observation of operation;
- d. be located such that the flow to the rapid mix is by gravity;
- e. shall be located and protective curbing provided (containment), so that chemicals from equipment failure, spillage or accidental drainage shall not enter the water through conduits, treatment or storage basins, or result in hazardous or unpermitted discharge.

19.1.6 FEEDER CONTROLS

- a. Feeders may be manually or automatically controlled, with automatic controls being designed so as to allow override by manual controls.
- b. Process must be manually started following shutdowns.

- c. At automatically operated facilities, chemical feeders shall be electrically interconnected with the well or service pump and should be provided a nonstandard electrical receptacle.
- d. Chemical feed rates shall be proportional to flow.
- e. A means to measure water flow must be provided in order to determine chemical feed rates.
- f. Provisions shall be made for measuring the quantities of chemicals used.

19.1.7 WEIGHING SCALES

- a. shall be provided for weighing cylinders, at all plants utilizing chlorine gas;
- b. shall be provided to measure fluoride solution feed;
- c. should be provided for volumetric dry chemical feeders; and
- d. should be accurate to measure increments of 0.5 % of load.

19.1.8 <u>IN-PLANT WATER SUPPLY</u> – Service water supply shall be:

- a. only from a safe, approved source. It can be obtained from a location sufficiently downstream of any chemical feed point to assure adequate mixing.
- b. ample in quantity and adequate in pressure;
- c. provided with means for measurement when preparing specific solution concentrations by dilution;
- d. properly treated for hardness, when necessary;
- e. properly protected against backflow, by appropriate mean such as:
 - 1. an air gap between fill pipe and maximum flow line of solution or dissolving tank equivalent to 2 pipe diameters but not less than 6 inches; or
 - 2. an approved reduced pressure backflow preventer, consistent with the degree of hazard, aggressiveness of chemical solution, back pressure sustained, and available means for maintaining and testing the device; or
 - 3. a satisfactory vacuum relief device.

f. Where a booster pump is required, duplicate equipment should be provided and, when necessary, standby power.

19.2.0 STORAGE OF CHEMICALS

- a. Space should be provided for:
 - 1. at least 30 days of chemical supply;
 - 2. convenient and efficient handling of chemicals;
 - 3. dry storage conditions;
 - 4. a minimum storage volume of 1-1/2 truck loads where purchase is by truck load lots;
 - 5. protection against excessive, damaging or dangerous extremes in temperature.
- b. Storage tanks and pipelines for liquid chemicals shall be specific to the chemicals and not for alternates.
- c. Chemicals shall be stored in covered or unopened shipping containers, unless the chemical is transferred into an approved storage unit.
- d. Liquid chemical storage tanks must:
 - 1. have a liquid level indicator;
 - 2. have an overflow and a receiving basin or drain capable of receiving accidental spills or overflows;
 - 3. provide for protection against freezing and/or loss from solution due to temperature drop.

19.2.1 SOLUTION TANKS

- a. A means which is consistent with the nature of the chemical solution shall be provided in a solution tank to maintain a uniform strength of solution.
- b. Continuous agitation shall be provided to maintain slurries in suspension.
- c. Two solution tanks of adequate volume may be required for a chemical to assure continuity of supply in servicing a solution tank.
- d. Each tank shall be provided with a drain,

- 1. No direct connection between any tank or drain and a sewer shall be allowed; and
- 2. Any drain must terminate at least 2 pipe diameters above the overflow rim of a receiving sump, conduit or waste receptacle.
- e. Means shall be provided to indicate the solution level in the tank.
- f. Make-up water shall enter the tank above the maximum solution level, providing an air gap of 2 pipe diameters but not less than 6 inches, or shall be protected with an approved backflow prevention devices.
- g. Chemical solutions shall be kept covered. Large tanks with access openings shall have such openings curbed and fitted with overhanging covers.
- h. Subsurface locations for solution tanks shall:
 - 1. be free from sources of possible contamination; and,
 - 2. assure positive drainage for groundwaters, accumulated water, chemical spills and overflows.
- i. Overflow pipes, when provided, should:
 - 1. be turned downward, with the end screened;
 - 2. have a free fall discharge; and
 - 3. be located where noticeable.
- j. Acid storage tanks must be vented to the outside atmosphere, but not through vents in common with day tanks.
- k. Each tank shall be provided with a valved drain and protected against backflow.
- 1. Solution tanks shall be located and protective curbings provided so that chemicals from equipment failure, spillage or accidental drainage shall not enter the water in conduits, treatment or storage basins.

19.2.2 DAY TANKS

- a. Day tanks shall be provided where bulk storage of liquid chemical is provided.
- b. Day tanks should hold no more than a 30 hour supply.

- c. Day tanks shall be scale-mounted, or have a calibrated gauge painted or mounted on the side if liquid level can be observed in a gauge tube or through translucent sidewalls of the tank. In opaque tanks, a gauge rod extending above a reference point at the top of the tank, attached to a float may be used. The ratio of the area of the tank to its height must be such that unit readings are meaningful in relation to the total amount of chemical fed during a day.
- d. Hand pumps may be provided for transfer from a carboy or drum. A tip rack may be used to permit withdrawal into a bucket from a spigot. Where motor-driven transfer pumps are provided, a liquid level limit switch and an over-flow from the day tank, must be provided.
- e. A means which is consistent with the nature of the chemical solution shall be provided to maintain uniform strength of solution in a day tank. Continuous agitation shall be provided to maintain chemical slurries in suspension.
- f. Tanks shall be properly labeled to designate the chemical contained.

19.3.0 CHEMICAL FEED LINES

- a. should be as short as possible, and
 - 1. of durable, corrosion-resistant material;
 - 2. easily accessible throughout the entire length;
 - 3. protected against freezing;
 - 4. easily cleaned;
 - 5. lime feed lines should be designed so that they can be easily replaced;
 - 6. avoid sharp bends when possible.
- b. should slope upward from the chemical source to the feeder when conveying gases;
- c. should introduce corrosive chemicals in such manner as to minimize potential for corrosion;
- d. shall be designed consistent with scale-forming or solids depositing properties of the water, chemical, solution or mixtures conveyed;
- e. shall not carry chlorine gas beyond chlorine storage and feeder room(s) except under vacuum;
- f. should be color coded.

19.4.0 HANDLING OF CHEMICALS

- a. Carts, elevators and other appropriate means shall be provided for lifting chemical containers to minimize excessive lifting by operators.
- b. Provisions shall be made for disposing of empty bags, drums or barrels by an approved procedure which will minimize exposure to dusts.
- c. Provision must be made for the proper transfer of dry chemicals from shipping containers to storage bins or hoppers, in such a way as to minimize the quantity of dust which may enter the room in which the equipment is installed. Control should be provided by use of:
 - 1. vacuum pneumatic equipment or closed conveyor systems;
 - 2. facilities for emptying shipping containers in special enclosures; and/or
 - 3. exhaust fans and dust filters which put the hoppers or bins under negative pressure.
- d. Provision shall be made for measuring quantities of chemicals used to prepare feed solutions and for easy calibration of solution pumps measured from the suction side.
- e. Storage tanks and pipelines for liquid chemicals shall be specific to the chemicals and not for alternates.
- f. Chemicals that are incompatible shall not be fed, stored or handled together.
- g. Precautions shall be taken with electrical equipment to prevent explosions, particularly in the use of sodium chlorite and activated carbon.
- h. Acids shall be kept in closed, acid resistant shipping containers or storage units. Acids shall not be handled in open vessels, but should be pumped in undiluted form from original containers, through suitable hose, to the point of treatment or to a covered day tank.

19.5.0 <u>HOUSING</u>

- a. Structures, rooms and areas accommodating chemical feed equipment shall provide convenient access for servicing, repair and observation of operation.
- b. Floor surfaces shall be smooth and impervious, slip-proof and well drained with 2.5 % minimum slope.
- c. Vents from feeders, storage facilities and equipment exhaust shall discharge to the outside atmosphere above grade and remote from air intakes.

d. Open basins, tanks and conduits shall be protected from chemical spills or accidental drainage.

19.5.1 CHLORINE GAS FEED AND STORAGE SHALL BE:

- a. enclosed and separated from other operating areas in order to prevent injury to personnel and damage to equipment;
- b. provided with a shatter resistant inspection window installed in an interior wall, to permit viewing of the interior of the room and equipment;
- c. constructed in such a manner that all openings between the chlorine room and the remainder of the plant are sealed;
- d. provided with doors equipped with panic hardware, assuring ready means of exit and opening outward only to the building exterior;
- e. provided with locks to prevent unauthorized entry;
- f. Full and empty cylinders of chlorine gas should be:
 - 1. isolated from operating areas;
 - 2. restrained in position to prevent upset;
 - 3. stored in rooms separate from ammonia storage; and,
 - 4. stored in areas not in direct sunlight or exposed to excessive heat.
- g. Where chlorine gas is used, the room shall be constructed to provide the following:
 - 1. each room shall have a ventilating fan with a capacity which provides one complete air change per minute when the room is occupied;
 - 2. the air outlet from the room shall be near the floor level and the point of discharge shall be so located as not to contaminate air inlets to any rooms or structures, or adversely affect the surrounding environment;
 - 3. air inlets should be through louvers near the ceiling, and temperature controlled to prevent adverse affect on chlorinator;
 - 4. louvers for chlorine room air intake and exhaust fan shall facilitate airtight closure;

- 5. separate switches for the fan and lights shall be located outside of the chlorine room, at the entrance. The exhaust fan should automatically be activated when the door is opened. Outside switches shall be protected from vandalism. A signal light indicating fan operation shall be provided at each entrance when the fan can be controlled from more than one point;
- 6. vents from feeders and storage shall discharge to the outside atmosphere, above grade;
- 7. the room location should be on the prevailing downwind side of the building away from entrances, windows, louvers, walkways, etc.;
- 8. floor drains are discouraged. Where provided, the floor drains shall discharge to the outside of the building and shall not be connected to other internal or external drainage systems;
- 9. Chlorinator rooms should be heated to 60° F, but should be protected from excessive heat. Cylinders and gas lines should be protected from temperatures above that of the feed equipment;
- 10. Pressurized chlorine feed lines shall not carry chlorine gas beyond the chlorinator room;
- 11. Gaseous feed chlorine installations shall be equipped with a gas detection device connected to an audible alarm to prevent undetected potentially dangerous leakage of chlorine gas.

19.6.0 SPECIAL PRECAUTIONS MUST BE TAKEN WITH:

- a. Acids and Caustics
 - 1. Acids and caustics shall be kept in closed corrosion-resistant shipping containers or storage units.
 - 2. Acids and caustics shall not be handled in open vessels, but should be pumped in undiluted form from original containers through suitable hose, to the point of treatment or to day tanks.
 - 3. Acid storage tanks must be vented to the outside atmosphere, but not through vents in common with day tanks.
 - 4. Liquid caustic (50% sodium hydroxide solution) which is hazardous and may be lost from solution at low temperatures.

- b. <u>Sodium Chlorite for Chlorine Dioxide Generation</u>: For Sodium Chlorite in chlorine dioxide generation, provisions shall be made for proper storage and handling of sodium chlorite to eliminate any danger of explosion.
 - 1. Storage
 - (A) Sodium chlorite shall be stored by itself in a separate room and preferably shall be stored in an outside building detached from the water treatment facility. It must be stored away from organic materials which would react violently with sodium chlorite.
 - (B) The storage structures shall be constructed of noncombustible materials.
 - (C) If the storage structure must be located in an area where a fire may occur, water must be available to keep the sodium chlorite area cool enough to prevent decomposition from heat and the resultant explosive conditions.
 - 2. Handling
 - (A) Care should be taken to prevent spillage.
 - (B) An emergency plan of operation should be available for the clean up of any spillage.
 - (C) Storage drums must be thoroughly flushed prior to recycling or disposal.
 - 3. Feeders
 - (A) Positive displacement feeders shall be provided.
 - (B) Tubing for conveying sodium chlorite or chlorine dioxide solutions shall be Type 1 PVC, polyethylene or materials recommended by the manufacturer.
 - (C) Chemical feeders may be installed in chlorine rooms if sufficient space is provided or facilities meeting the requirements stated in this document shall be provided.
 - (D) Feed lines shall be installed in a manner to prevent formation of gas pockets and shall terminate at a point of positive pressure.
 - (E) Check valves shall be provided to prevent the backflow of chlorine into the sodium chlorite line.

- c. <u>Activated Carbon</u>: Activated carbon, which is a potentially combustible material, requiring isolated, fireproof storage and explosion-proof electrical outlets, lights and motors in areas of dry handling.
- d. <u>Calcium Hypochlorite and Potassium Permanganate</u>: Calcium hypochlorite and potassium permanganate, which may ignite spontaneously on contact with combustible substances.
- e. <u>Hydrofluosilicic Acid</u>: Hydrofluosilicic acid, which is extremely corrosive. Fumes or spillage may damage equipment or structures.

19.6.0 CHEMICALS

- a. Chemical containers shall be fully labeled to include:
 - 1. chemical name, purity and concentration;
 - 2. supplier name and address; and,
 - 3. expiration date where applicable.
- b. Chemicals shall be listed as meeting NSF Standard 60 and shall meet AWWA specifications, where applicable.
- c. Provisions should be made for assay of chemicals delivered.
- d. Chemicals shall not impart any toxic material to the water under recommended dosages.

19.7.0 OPERATOR SAFETY

- a. Gases from feeders, storage and equipment exhausts shall be conveyed to the outside atmosphere, above grade and remote from air intakes.
- b. Special provisions shall be made for ventilation of chlorine feed and storage rooms. See the applicable section in this document.
- c. Respiratory protection equipment, meeting the requirements of the National Institute for Occupational Safety and Health (NIOSH) shall be available where chlorine gas is handled. It shall be stored at a convenient location that is easily accessible to the operator, but not inside any room where chlorine is used or stored. The units shall use compressed air and have at least a 30 minute capacity. Provision of a 30 minute backup cylinder is urged to prevent loss of utility while the primary air cylinder is being refilled or tested. It is preferred that the unit be compatible with or exactly the same as units used by the fire department responsible for the plant.

- d. A bottle of ammonium hydroxide, 56 % ammonia solution, shall be available for chlorine leak detection.
- e. Although the gaseous feed chlorine installations should be provided with appropriate leak repair kits, where ton containers are used, a leak repair kit approved by the Chlorine Institute must be provided. Continuous chlorine leak detection equipment is recommended. Where a leak detector is provided it shall be equipped with both an audible alarm and a warning light.
- f. At least one pair of rubber gloves, a dust respirator of a type certified by NIOSH for toxic dusts, an apron or other protective clothing like rubber boots and goggles or face mask shall be provided for each operator in any shift who will handle dry chemicals, preparing chemical solutions, or cleaning up spills.
- g. A deluge shower and/or eyewashing device should be installed where strong acids and alkalis are used or stored. A water holding tank that will allow water to come to room temperature should be installed in the water line feeding the deluge shower and eyewashing device, as necessary.
- h. Other protective equipment and facilities should be provided as necessary.

PART 20 - LABORATORY FACILITIES

20.1.0 GENERAL

- a. Laboratory equipment and facilities shall be compatible with the raw water source, intended design of the treatment plant, daily monitoring and the complexity of the treatment process involved.
- b. Recognized laboratory procedures must be utilized and the testing equipment shall be acceptable to the Division.
- c. Laboratory facilities and any other part of the water treatment plant should not be used for activities and/or purposes that are not pertinent to the operation of the plant or in the execution of the duties of the operator and/or the laboratory analyst.

20.1.1 LABORATORY SPACE AND FACILITIES

- a. Laboratory facilities shall be located in a separate room from office/lunch activities and from the treatment units. Facilities shall be isolated by doors and not be located in the main traffic pattern.
- b. Sufficient bench space, adequate ventilation, adequate lighting, storage room, laboratory sink, and auxiliary facilities shall be provided.
- c. The bacteriological laboratory, if provided, shall be acceptable to the Division. It shall have adequate counter space and shall be located in a separate room or area.

20.1.2 <u>SAMPLE TAPS</u> - Sample taps shall be provided so that water samples can be obtained from each water source and from appropriate locations in each unit operation of treatment. Taps shall be consistent with sampling needs and not be of petcock type. Sample lines and pumps where applicable shall be sized to minimize time lag between point of sampling and point of sample collection.

20.1.3 <u>RECORDS MAINTENANCE</u>

20.1.3.1 <u>GENERAL</u> - Daily records of the operation of the water treatment facility and water distribution system, including the amount of water treated daily, results of the performance of daily tests pertinent to the control of the water treatment processes, jar tests, disinfectant residuals, tests performed in the water distribution system, and any test results and records as may be required by the Division shall be maintained by the water supplier. These records shall be kept on the premises or at a convenient location near the water plant.

20.1.3.2 <u>RECORDS MAINTENANCE DURATION</u>

- a. <u>Microbiological:</u> Records of microbiological analyses shall be kept for not less than five (5) years.
- b. <u>Chemicals</u>: Records of chemical analyses shall be kept for not less than ten (10) years.
- c. <u>Lead/ Copper</u>: Original records of all lead and copper sampling data, analyses, reports, surveys, letters, evaluations, schedules, Division determinations, and any other related information shall be kept for not less than twelve (12) years.
- d. <u>Individual Filter Monitoring</u>: Records of individual filter monitoring results that are taken under Rules for Safe Drinking Water, Chapter 391-3-5-.20(9)(c) shall be maintained for at least three (3) years.
- e. <u>Violations</u>: Records of action taken by the system to correct violations of the Rules for Safe Drinking Water, Chapter 391-3-5, shall be kept for a period of not less than three (3) years after the last action taken with respect to the particular violation.
- f. <u>Inspections/Sanitary Survey Reports</u>: Copies of any written reports, summaries or communications relating to sanitary surveys of the system conducted by the system itself, by a private consultant, or by any local, state or federal agency, shall be kept for a period not less than ten (10) years after completion of the sanitary survey involved.
- g. <u>Variance/ Exemption</u>: Records concerning a variance or exemption granted to the system shall be kept for a period ending not less than five (5) years following the expiration of such variance or exemption.

- END –



The Standardized Monitoring Framework: A Quick Reference Guide

Overview of the Framework

Title*	The Standardized Monitoring Framework (SMF), promulgated in the Phase II Rule on January 30, 1991 (56 FR 3526).
Purpose	To standardize, simplify, and consolidate monitoring requirements across contaminant groups. The SMF increases public health protection by simplifying monitoring plans and synchronizing monitoring schedules leading to increased compliance with monitoring requirements.
General Description	The SMF reduces the variability within monitoring requirements for chemical and radiological contaminants across system sizes and types.
*This docume	nt provides a summary of federal drinking water requirements; to ensure full compliance,

Additional Requirements

The SMF outlined on these pages summarizes existing systems' ongoing federal monitoring requirements only. Primacy agencies have the flexibility to issue waivers, with EPA approval, which take into account regional and state specific characteristics and concerns. To determine exact monitoring requirements, the SMF must be used in conjunction with any EPA approved waiver and additional requirements as determined by the primacy agency.

New water systems may have different and additional requirements as determined by the primacy agency.

please consult the federal regulations at 40 CFR 141 and any approved state requirements.

SMF Benefits

Implementation of the SMF results in . . .

- Increased public health protection through monitoring consistency.
- A reduction in the complexity of water quality monitoring from a technical and managerial perspective for both primacy agencies and water systems.
- Equalizing of resource expenditures for monitoring and vulnerability assessments.
- Increased water system compliance with monitoring requirements.

Regulated Contaminants

Inorganic Contaminants (IOCs)	Fifteen (15) (Nitrate, Nitrite, total Nitrate/ Nitrite, and Asbestos are exceptions to SMF)
Synthetic Organic Contaminants (SOCs) & Volatile Organic Contaminants (VOCs)	Fifty-One (51)
Radionuclides	Four (4)

Utilitie	s Covered
All PWSs	Nitrate Nitrite
CWSs	IOCs SOCS VOCs Radionuclides
NTNCWSs	IOCs SOCS VOCs

For additional information:

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA web site at <u>http://water.epa.gov/drink</u> or contact your primacy agency's drinking water representatives.

See 40 CFR 141.23 regarding IOCs; 40 CFR 141.24 regarding VOCs and SOCs; and 40 CFR 141.26 regarding Radionuclides.

Office of Water (4606M)

STANDARDIZED MONITORING FRAMEWORK

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STANDARDIZED MONITORING FRAMEWORK

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je.	≥ 1/2 MCL	****	****	****	****	* ****	** ****	** ****	**** ****	****	**** *	****	****	****	****	****	****	****
iti	Groundwater Reliably and Consistently < MCL ⁹	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Ν	Surface Water with 4 Quarters of Results < 1/2 MCL ⁹	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	TNCWSs	•		•				-				-		-				
	Standard Monitoring	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Ð		20	63	Þ 0	90	90	20	80	01 60	11	15	13	14	91	91	21	81	61
tir	< 1/2 MCL					#				_			_	#				
<u>†</u> !	Reliably and Consistently < MCL ⁹	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
N	> 1/2 MCL or not Reliably and Consistently < MCL	****	****	****	***	* ***	** ***	**** ****	**** **	****	**** *	**** *	***	* * * *	* * * *	****	****	****
S		20	63	Þ 0	90	90	20	80	01 60	11	12	13	14	91	91	21	81	61
әр - о	< Detection Level				****	*					*						*	
ib il:	≥ Detection Level but ≤ 1/2 MCL	- 			****	*				*						*		
в Я В а	> 1/2 MCL but ≤ MCL	 			****	*		*			*			*			*	
u	> MCL	1		****	****	* ***	** ****	**** ****	**** **	****	***	**** *	***	* * * *	****	****	****	****
s c		20	03	† 0	90	90	20	80	٥٢ 60	11	15	13	14	91	91	21	81	61
512	Waiver		×			×		×			×			×			×	
a q s	No Waiver, Reliably and Consistently ≤ MCL, or vulnerable to asbestos contamination ¹⁰			-	-	*								*				
A	> WCL	****	****	* * * *	****	* ***	** ****	**** ****	**** **	****	****	****	****	****	****	****	****	****
		'Until January 22, 2006 the maximum contaminant level (MCL) for arsenic is 50 µg/L; on January 23, 2006 the MCL for arsenic becomes 10 µg/L.	2006 the	maximum	contamir	ant level (N	1CL) for ar	senic is 50) hg/L; on J	anuary 2	3, 2006 tl	ne MCL for	arsenic be	ecomes 10) µg/L.			
Legend		² Based on 3 rounds of monitoring at each EPTDS with all analytical results below the N requirements, however systems are eligible for arsenic waivers after January 23, 2006.	ds of mon vever syst	itoring at ∈ tems are e	eligible for	monitoring at each EPTDS with all analytical results below the MCL. Waivers are not permitted under the current arsenic r systems are eligible for arsenic waivers after January 23, 2006.	analytical re ivers after	esults belo January 2	ow the MCI 3, 2006.	. Waiver	s are not	permitted u	nder the c	current ars	enic			
* = 1 sar	= 1 sample at each entry point to distribution system (EPTDS). $\frac{{}^{3}A_{SY}}{and c}$	³ A system with a sampling point result above the MCL must collect quarterly samples, at that sampling point, until the system is determined by the primacy agency to be reliably and consistently below the MCL.	ampling pelow the l	point result MCL.	t above th	e MCL mus	it collect qu	arterly sa	mples, at tl	at samp	ling point,	until the sy	stem is d	etermined	by the pri	imacy age	ncy to be I	eliably
** = 2 qu during 1	** = 2 quarterly samples at each EPTDS. Samples must be taken *Sam during 1 calendar year during each 3-year compliance period. const	⁴ Samples must be taken during the quarter which previously resulted in the highest analytical result. Systems can apply for a waiver after 3 consecutive annual sampling results are below the detection limit.	taken du al samplir	iring the qu	uarter whi are below	ch previous the detectio	ly resulted on limit.	in the hig	hest analyt	ical resul	t. System	s can apply	for a waiv	ver after 3				
**** = 4 0	⁶ Grou **** = 4 quarterly samples at each EPTDS within time frame the st	⁶ Croundwater systems must update their vulnerability assessments during the time the waiver is effective. Primacy agencies must re-confirm that the system is non-vulnerable within 3 years of the initial determination or the system must return to annual sampling.	tems mus -vulnerabl	st update tl le within 3	heir vulne years of 1	rability asse he initial de	essments d terminatior	uring the 1 or the sy	time the wa	aiver is ef return to	fective. P annual si	rimacy age ampling.	ncies mus	t re-confirr	m that			
designat		off all monitoring results during initial quarterly monitoring are less than the detection limit, the system can take annual samples. If after a minimum of 3 years of annual sampling	esults dur	ing initial c	quarterly r	nonitoring a	re less tha	n the dete	ction limit,	the syste	m can tał	te annual s	amples. If	after a mi	nimum of	3 years of	annual sa	ampling

^olf all monitoring results during initial quarterly monitoring are less than the detection limit, the system can take annual samples. If after a minimum of 3 years of annual sampling with all analytical results less than the detected nimit, the primacy agency can allow a system to take 1 sample during each compliance period. Systems are also eligible for a waiver. ^elf all monitoring results during initial quarterly monitoring are less than the detection limit, the system can take annual samples. Systems are also eligible for a waiver. ¹⁶Systems are required to monitor for asbestos during the first 3-year compliance period of each 9-year compliance cycle. A system vulnerable to asbestos contamination due solely to corrosion of asbestos-cement pipe must take 1 sample at a tap served by that pipe. A system vulnerable to asbestos contamination at the source must sample at each EPTDS. ⁷Primacy agencies must determine that a surface water system is non-vulnerable based on a vulnerability assessment during each compliance period or the system must return to annual sampling. ⁹Samples must be taken during the quarter which previously resulted in the highest analytical result. I = When allowed by the primacy agency, data collected between June 2000 and December 6, 2003 may be grandfathered to satisfy the initial monitoring requirements due in 2004 for gross alpha, radium 226/228, and uranium. # = Systems must monitor at a frequency specified by the primacy X = No sampling required unless required by the primacy agency. designated by the primacy agency. agency.





Arsenic and Clarifications to Compliance and New Source Monitoring Rule: A Quick Reference Guide

Overview	of the Rule
Title [*]	Arsenic and Clarifications to Compliance and New Source Monitoring Rule 66 FR 6976 (January 22, 2001)
Purpose	To improve public health by reducing exposure to arsenic in drinking water.
General Description	Changes the arsenic MCL from 50 μ g/L to 10 μ g/L; Sets arsenic MCLG at 0; Requires new systems and new drinking water sources to demonstrate compliance as specified by the State; Clarifies the procedures for determining compliance with the MCLs for IOCs, SOCs, and VOCs.
Utilities	All community water systems (CWSs) and nontransient, noncommunity water systems (NTNCWSs) must comply with the arsenic requirements. EPA estimates that 3,024 CWSs and 1,080 NTNCWSs will have to install treatment to comply with the revised MCL.

^{*}This document provides a summary of federal drinking water requirements; to ensure full compliance, please consult the federal regulations at 40 CFR 141 and any approved state requirements.

Public Health Benefits

Implementation of

the Arsenic Rule

will result in . . .

• Avoidance of 16 to 26 non-fatal bladder and lung cancers per year.

- Avoidance of 21 to 30 fatal bladder and lung cancers per year.
- Reduction in the frequency of non-carcinogenic diseases.

Critical Deadlines and Requirements

Consumer Confidence Report Requirements**

Report Due	Report Requirements
July 1, 2002 and beyond	For reports covering calendar years 2001 and beyond, systems that detect arsenic between 5 μ g/L and 10 μ g/L must include an educational statement in the CCRs.
July 1,2002 - July 1, 2006	For reports covering calendar years 2001 to 2005, systems that detect arsenic between 10 μ g/L and 50 μ g/L must include a health effects statement in their CCRs.
July 1, 2007 and beyond	For reports covering calendar year 2006 and beyond, systems that are in violation of the arsenic MLC (10 μ g/L) must include a health effects statement in their CCRs.
For Drinking	g Water Systems
Jan. 22, 2004	All <i>NEW</i> systems/sources must collect initial monitoring samples for all IOCs, SOCs, and VOCs within a period and frequency determined by the State.
Jan. 1, 2005	When allowed by the State, systems may grandfather data collected after this date.
Jan. 23, 2006	The new arsenic MCL of 10 μ g/L becomes effective. All systems must begin monitoring or when allowed by the State, submit data that meets grandfathering requirements.
Dec. 31, 2006	Surface water systems must complete initial monitoring or have a State approved waiver.
Dec. 31, 2007	Ground water systems must complete initial monitoring or have a State approved waiver.
For States	
Spring 2002	EPA meets and works with States to explain new rule and requirements and to support adoption and implementation activities.
Jan. 22, 2003	State primacy revision applications due.
Jan. 22, 2005	State primacy revision applications due from States that received 2-year extensions.

**For required educational and health effect statements, please see 40 CFR 141.154.

Compliance Determination (IOCs, VOCs, and SOCs)

1. Calculate compliance based on a running annual average at each sampling point.

2. Systems will not be in violation until 1 year of quarterly samples have been collected (unless fewer samples would cause the running annual average to be exceeded.)

3. If a system does not collect all required samples, compliance will be based on the running annual average of the samples collected.

Monitoring and Reporting Requirements for Total Arsenic⁽¹⁾

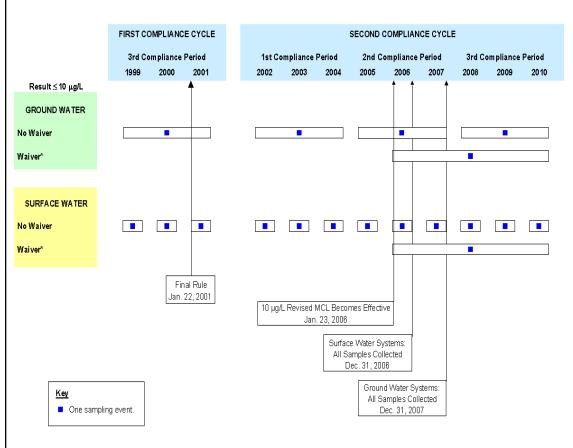
Monitoring

One sample after the effective date of the MCL (January 23, 2006). Surface water systems must take annual samples. Ground water systems must take one sample during the 2005-2007 compliance period. If the monitoring result is less than the MCL ground water systems must collect one sample every 3 years and surface water systems must continue to collect annual samples.

Increased Monitoring

A system with a sampling point result above the MCL must collect quarterly samples at that sampling point, until the system is reliably and consistently below the MCL.

⁽¹⁾All samples must be collected at each entry point to the distribution system, unless otherwise specified by the State.



*States may issue 9 year monitoring waivers under the January 22, 2001 final arsenic rule. To be eligible for a waiver, surface water systems must have monitored annually for at least 3 years. Ground water systems must conduct a minimum of 3 rounds of monitoring with detection limits below 10 µg/L.

For additional information on

Call the Safe Drinking Water Hotline at 1-800-426-4791:

http://water.epa.gov/drink; or contact your State drinking water representative.

visit the EPA Web site at

the Arsenic Rule

Applicability of Standardized Monitoring Framework to Arsenic



Consumer Confidence Report Rule: A Quick Reference Guide

Overview of the Rule

Title	Consumer Confidence Report (CCR) Rule, 40 CFR, Part 141, Subpart O.
Purpose	Improve public health protection by providing educational material to allow consumers to make educated decisions regarding any potential health risks pertaining to the quality, treatment, and management of their drinking water supply.
General Description	The CCR Rule requires all community water systems to prepare and distribute a brief annual water quality report summarizing information regarding source, any detected contaminants, compliance, and educational information.
Utilities Covered	Community water systems (CWSs), all size categories.

Public Health Related Benefits

Implementation of the CCR Rule will	•	Increased consumer knowledge of drinking water quality, sources, susceptibility, treatment, and drinking water supply management.
result in	•	Increased awareness of consumers to potential health risks, so they may make informed decisions to reduce those risks, including taking steps toward protecting their water supply.
	•	Increased dialogue with drinking water utilities and increased understanding of consumers to take steps toward active participation in decisions that affect public health.

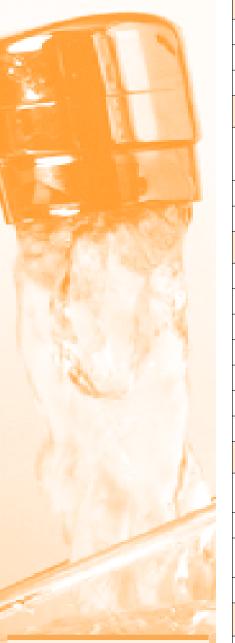
Annual Requirements

	•	<i>April 1</i> - Deadline for CWS that sells water to another CWS to deliver the information necessary for the buyer CWS to prepare their CCR (req. outlined in 40 CFR 141.152).
CWSs with 15 or more connections or serving at least 25		<i>July 1</i> - Deadline for annual distribution of CCR to customers and State or local primacy agency for report covering January 1 - December 31 of previous calendar year.
year round residents must prepare and distribute a CCR to	•	<i>October 1</i> - (or 90 days after distribution of CCR to customers, whichever is first) - Deadline for annual submission of proof of distribution to State or local primacy agency.
all billing units or service connections.	•	A system serving 100,000 or more persons must also post its current year's report on a publicly accessible site on the Internet. Many systems choose to post their reports at the following EPA website http://yosemite.epa.gov/ogwdw/ccr.nsf/america.
		All systems must make copies of the report available on request.

Small Water System Flexibility

- With the permission of the Governor of a State (or designee), or where the tribe has primacy, in lieu of mailing, systems serving fewer than 10,000 persons may publish their CCR in a local newspaper.*
- With the permission of the Governor of a State (or designee), or where the tribe has primacy, in lieu of mailing and/or publication, systems serving 500 or fewer persons may provide a notice stating the report is available on request.*

*Questions regarding whether the necessary permission has been granted should be addressed to the local State or primacy agency.



For additional information on the CCR Rule

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA website at www.epa.gov/safewater/ ccr1.html; log onto the CCRiWriter website to use EPA's template at www.CCRiWriter.com; view 40 CFR 141 subpart O; or contact your State or local primacy agency's drinking water representative.

Major Provisions to be Included in the CCR

Water System Information

Name/phone number of contact person.

Information on public participation opportunities (time and place for meetings or hearings).

Information for non-English speaking populations (if applicable).

Source of Water

Type (ex. groundwater or surface water), commonly used name, and location of water sources (ex. Potomac River, Snake River Plain Aquifer, etc.) (Exact locations/coordinates of wells and intakes should not be included for security reasons.)

Availability of source water assessment.

Brief summary on potential sources of contamination (if available).

Definitions

Maximum Contaminant Level (MCL).

Maximum Contaminant Level Goal (MCLG).

Treatment Technique (TT) (if applicable).

Maximum Residual Disinfectant Level (MRDL) (if applicable).

Maximum Residual Disinfectant Level Goal (MRDLG) (if applicable).

Action Level (AL) (if applicable).

Variances and Exemptions (if applicable).

Detected Contaminants

Table summarizing data on detected regulated and unregulated contaminants that were detected during the last round of sampling.

Known or likely source of each detected contaminant.

Health effects language for any violations, exceedances or when Arsenic levels are > 0.01 mg/L or \leq 0.05 mg/L.

Information on Cryptosporidium, Radon, and other contaminants (if applicable).

Compliance with Drinking Water Regulations

Explanation of violations, length of violations, potential health effects, and steps taken to correct the violations.

Explanation of variance/exemption (if applicable).

Required Educational Information

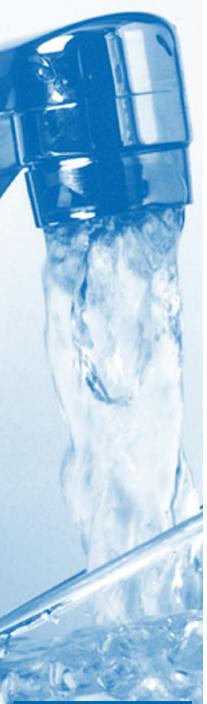
Explanation of contaminants and their presence in drinking water including bottled water.

Warning for vulnerable or immunocompromised populations about Cryptosporidium.

Informational statements on arsenic, nitrate, lead, and TTHM (if applicable).

EPA's Safe Drinking Water Hotline Number of (1-800-426-4791).





¹This document provides a summary of federal drinking water requirements; to ensure full compliance, please consult the federal regulations at 40 CFR 141 and any approved state requirements.

² The June 1991 LCR was revised with the following Technical Amendments: 56 FR 32112, July 15, 1991; 57 FR 28785, June 29, 1992; 59 FR 33860, June 30, 1994.

It was subsequently revised by: the LCR Minor Revisions, 65 FR 1950, January 12, 2000; and the LCR Short-Term Revisions, 72 FR 57782, October 10, 2007.

Lead and Copper Rule: A Quick Reference Guide

Purpose	5 / / / / / /									
-	Protect public health by minimizing lead (Pb) and copper (Cu) levels in drinking water, primarily by reducing water corrosivity. Pb and Cu enter drinking water mainly from corrosion of Pb and Cu containing plumbing materials.									
General Description	water samples. An Al quality parameter (W	Establishes action level (AL) of 0.015 mg/L for Pb and 1.3 mg/L for Cu based on 90 th percentile level of tap water samples. An AL exceedance is not a violation but can trigger other requirements that include water quality parameter (WQP) monitoring, corrosion control treatment (CCT), source water monitoring/treatment, public education, and lead service line replacement (LSLR). All community water systems (CWSs) and non-transient non-community water systems (NTNCWSs) are								
Utilities Covered	All community water subject to the LCR re		non-transient non-com	munity water systems	(NTNCWSs) are					
ublic He	ealth Benefits									
mplementation of the LCR has esulted in	especially for Reduction in r	young children and pr isk of exposure to Cu	that can cause damage egnant women. that can cause stomac on's disease in genetica	h and intestinal distres	s, liver or kidney					
	onitoring Provi	sions								
ead and	Copper Tap									
Applicability	► All CWSs and N	INCWSs.								
Standard	 CWSs and NTNCWSs must collect first-draw samples at taps in homes/buildings that are at high risk of Pb/Cu contamination as identified in 40 CFR 141.86(a). Number of samples is based on system size (see Table 1). Systems must conduct monitoring every 6 months unless they qualify for reduced monitoring. 									
Reduced		ample number and Ta	,		ormoning.					
	ality Parameter (•								
	· ·	> 50,000 people.								
ppiloability	, , ,	<i>i</i>	toring periods in which	either AL is exceeded.						
Standard Reduced	 WQPs at entry prinstallation, then See Table 1 for s 	every 2 weeks. ample number and pa	stem (EPTDS) are colle age 2 for criteria. Does	not apply to EPTDS W						
	Ta		oper Tap and WQP T	ap Monitoring	••••••					
Size Catego	ry System Size	Number of Pb/Cu	Tap Sample Sites ³	Number of WQP 1	Tap Sample Sites ⁴					
Size Calegoi	y System Size	Standard	Reduced	Standard	Reduced					
Lorgo	> 100K	100	50	25	10					
Large	50,001 - 100K	60	30	10	7					
Ma -l'arres	10,001 - 50K	60	30	10	7					
Medium	3,301 - 10K	40	20	3	3					
	501 - 3,300	20	10	2	2					
Small	101 - 500	10	5	1	1					
	≤ 100	5	5	1	1					
³ With writter ⁴ Two WQP t Annual	ap samples are collect 1. PWS serves ≤	ted at each sampling s Table 2: Criteria for 50,000 people and is	bles if all taps used for i site. Reduced Pb/Cu Tap \leq both ALs for 2 consection (OWQPs) and is \leq Pb /	Monitoring cutive 6-month monitor	ing periods; or					
Triennial	2. Any PWS that	meets OWQP specific	\leq both ALs for 3 conse ations and is \leq Pb AL f d Cu levels \leq 0.005 mg	or 3 consecutive years	of monitoring; or					

Lead Consumer Notice

Within 30 days of learning the results, all systems must provide individual Pb tap results to people who receive water from sites that were sampled, *regardless of whether the results exceed the Pb AL*, as required by 40 CFR 141.85(d).

Consumer Confidence Report (CCR)

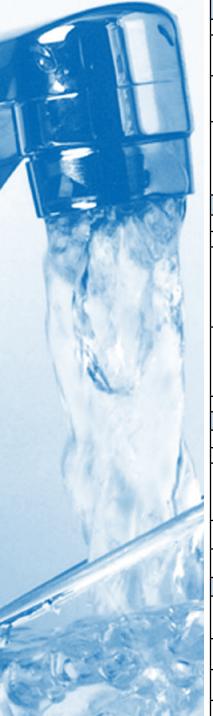
All CWSs, irrespective of their lead levels, must provide an educational statement about lead in drinking water in their CCRs as required by 40 CFR 141.154. Must be in 2008 CCR (due July 1, 2009) if EPA is Primacy Agency, State adopts the rule by reference automatically, or adopts during 2008. Otherwise, this statement is required in the 2009 CCR (due July 1, 2010).

Treatment Technique and Sampling Requirements if the AL is Exceeded⁵

⁵ Based on 90th percentile level. Multiply number of valid samples by 0.9 (e.g., 10 samples x 0.9 = 9; thus, use 9th highest Pb and Cu test result to compare to AL). For 5 samples, average 4^{th} and 5th highest results. For < 5 samples, use highest result.

Water Quality Parameter (WQP)

Applicability	Refer to page 1.
Parameters	pH, alkalinity, calcium (initial only, unless calcium carbonate stabilization is used), conductivity (initia monitoring only), orthophosphate (if inhibitor is phosphate-based); silica (if inhibitor is silicate-based and temperature (initial monitoring only).
Frequency	 Systems installing CCT, must conduct follow-up monitoring for 2 consecutive 6-month periods. WQP tap monitoring is conducted every 6 months, EPTDS monitoring increases to every 2 weeks. After follow-up monitoring, State sets OWQP specifications that define optimal CCT.
Reduced Tap	 Collect reduced number of sampling sites (see Table 1) if meet OWQPs for 2 consecutive 6-month
Monitoring	periods.
	 Collect reduced number of sampling sites at reduced frequency if meet OWQPs for:
	 6 consecutive 6-month monitoring periods can monitor annually;
	 3 consecutive years of annual monitoring can monitor triennially.
Public Educat	ion (PE)
Applicability	 Systems that exceed the Pb AL (not required if only the Cu AL is exceeded).
Purpose	 Educates consumers about lead health effects, sources, and steps to minimize exposure.
Delivery Method	 CWSs: deliver materials to bill-paying customers and post lead information on water bills, work in concert with local health agencies to reach at-risk populations (children, pregnant woman), deliver to other organizations serving "at-risk" populations, provide press releases, include new outreach activities from list in 40 CFR 141.85(a)(2)(vi), and post to Web site (CWSs serving > 100,000 only). NTNCWSs: posting and distribution to all consumers (can be electronic with State permission). Can apply to CWSs such as hospitals and prisons where population cannot make improvements.
Timing	 Within 60 days after end of monitoring period in which Pb AL was exceeded if not already delivering PE.⁶
	 Repeat annually except: water bill inserts - quarterly; press releases - 2x/year, and Web posting - continuous.
	► Can discontinue whenever ≤ Pb AL but must recommence if subsequently exceed Pb AL.
⁶ State may allow	extension in some situations. Also, State may require approval of message content prior to delivery.
Source Water	Monitoring and Source Water Treatment (SOWT)
Applicability	 Systems that exceed Pb or Cu AL.
Purpose	• Determine contribution from source water to total tap water Pb and Cu levels and need for SOWT.
Timing	 One set of samples at each EPTDS is due within 6 months of first AL exceedance.
	 System has 24 months to install any required SOWT.
	 State sets maximum permissible levels (MPLs) for Pb and Cu in source water based on initial and follow-up source water monitoring.
Standard	 Ground water PWSs monitor once during 3-year compliance periods; surface water PWSs monitor annually.
Reduced	 Monitor every 9 years if MPLs are not exceeded during 3 consecutive compliance periods for groun water PWSs or 3 consecutive years for surface water PWSs.
Corrosion Co	ontrol Treatment (CCT)
Applicability	 All large systems except those meeting requirements of 40 CFR 141.81(b)(2) or (b)(3).
	Medium and small systems that exceed either AL; may stop CCT steps if ≤ both ALs for 2 consecuti 6-month periods but must recommence CCT if subsequently exceed either AL.
Study	 All large systems except as noted above. If State requires study for small or medium systems, it must be completed within 18 months.
Treatment	 Once State determines type of CCT to be installed, PWS has 24 months to install.
	 Systems installing CCT must conduct 2 consecutive 6 months of follow-up tap and WQP monitoring
OWQPs	► After follow-up Pb/Cu tap and WQP monitoring, State sets OWQPs. <i>Refer to WQP section above.</i>
Lead Service	Line Replacement (LSLR)
Applicability	 Systems that continue to exceed the Pb AL after installing CCT and/or SOWT.
	Can discontinue LSLR whenever ≤ Pb AL in tap samples for 2 consecutive 6-month monitoring periods; must recommence if subsequently exceed.
Monitoring	▶ Optional: Sample from LSL to determine if line must be replaced. If all samples are ≤ 0.015 mg/L, line is considered "replaced through testing"; must reconsider these lines if Pb AL is subsequently exceeded.
	 Required: Sample from any LSLs not completely replaced to determine impact on Pb levels.
Replacement	 Must replace at least 7% of LSLs annually; State can require accelerated schedule. If only portion of LSL is replaced, PWS must:
	- Notify customers at least 45 days prior to replacement about potential for increased Pb levels



For additional information on the LCR

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA Web site at http://water.epa.gov/drink; or contact your State drinking water representative.





Comprehensive Surface Water Treatment Rules Quick Reference Guide: Systems Using Conventional or Direct Filtration

Overview of the Rules			
Title*	Surface Water Treatment Rule (SWTR) - 40 CFR 141.70-141.75 Interim Enhanced Surface Water Treatment Rule (IESWTR) - 40 CFR 141.170-141.175 Filter Backwash Recycling Rule (FBRR) 40 CFR 141.76 Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) - 40 CFR 141.500-141.571 Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) - 40 CFR 141.700-141.722		
Purpose	Improve public health protection through the control of microbial contaminants, particularly viruses, <i>Giardia lamblia</i> , and <i>Cryptosporidium</i> .		
General Description	 The Surface Water Treatment Rules: Applies to all public water systems (PWSs) using surface water or ground water under the direct influence of surface water (GWUDI), otherwise known as "Subpart H systems." Requires all Subpart H systems to disinfect. Requires Subpart H systems to filter unless specific filter avoidance criteria are met. Applies a treatment technique requirement for control of microbials. 		

*This document provides a summary of federal drinking water requirements; to ensure full compliance, please consult the federal regulations at 40 CFR 141 and any approved state requirements.

Overview of Requirements

The purpose of this table is to show how the requirements for the IESWTR, FBRR, LT1ESWTR and LT2ESWTR build on the existing requirements established in the original SWTR.

APPLICABILITY: PWSs that use surface water or GWUDI (Subpart H systems) that practice conventional or direct filtration.		Final Rule Dates				
		SWTR 1989	IESWTR 1998	LT1ESWTR 2002	LT2ESWTR 2006	FBRR 2001
	≥ 10,000	~	~		~	~
Population Served	< 10,000	>	For sanitary survey provisions only	~	>	~
	99.99% (4-log) removal/ inactivation of viruses	•	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR
Regulated	99.9% (3-log) removal/ inactivation of <i>Giardia lamblia</i>	>	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR
Pathogens	99% (2-log) removal of <i>Cryptosporidium</i>		>	~	Additional treatment may be required	Regulated under IESWTR and LT1ESWTR
Residual Disinfection	Entrance to distribution system (≥ 0.2 mg/L)	>	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR	
Requirements	Detectable in the distribution system	>	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR	
Source Water Monitoring Requirements and Bin Classification	Monitoring to calculate <i>Cryptosporidium</i> and determine appropriate bin classification for each plant required to monitor				>	
Turbidity	Combined Filter Effluent	•	~	~	Regulated under SWTR, IESWTR and LT1ESWTR	
Performance Standards	Individual Filter Effluent		>	~	Regulated under IESWTR and LT1ESWTR	
Disinfection Profiling and Benchmarking	Systems must profile inactivation levels and generate benchmark, if required		>	~	>	
Sanitary Surveys (state requirement)	CWS**: Every 3 years NCWS**: Every 5 years		>	Regulated under IESWTR	Regulated under IESWTR	
Finished Reservoirs/ Water Storage Facilities	All new facilities constructed must be covered		~	~	Regulated under LT1ESWTR	
	Uncovered facilities must be covered or discharge treated				>	
Operated by Qualified Personnel as Specified by State		>	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR

** Community water system (CWS), Noncommunity water system (NCWS)

Turbidity

Compliance with turbidity provisions is measured at the Combined Filter Effluent (CFE) and Individual Filter Effluent (IFE). The **CFE** turbidity results may mask the performance of an individual filter since the individual filter may have a turbidity spike of a short duration not detected by 4 hours CFE readings. **IFE** performance is measured in systems using conventional or direct filtration. The performance of each individual filter is critical to controlling pathogen breakthrough.

The IESWTR and LT1ESWTR created more stringent CFE turbidity standards and established a new IFE turbidity monitoring requirement to address *Cryptosporidium*. These new turbidity standards assure conventional and direct filtration systems will be able to provide 2-log *Cryptosporidium* removal. Subpart H systems using the Treatment Performance Toolbox option under the LT2ESWTR must meet the more stringent CFE and IFE turbidity monitoring levels in order to receive additional *Cryptosporidium* log credit.

Turbidity: Monitoring and Reporting Requirements					
Turbidity Type and Reporting Requirements (<i>Reports due by the 10th day of the following month the system serves water to the public.</i>)	Monitoring/ Recording Frequency	SWTR As of June 29, 1993	IESWTR ≥ 10,000 people As of January 1, 2002	LT1ESWTR < 10,000 people As of January 1, 2005	
CFE 95% Value Report total number of CFE measurements and number and percentage of CFE measurements ≤ 95 th percentile limit	At least every 4 hours*	≤ 0.5 NTU	≤ 0.3 NTU	≤ 0.3 NTU	
CFE Maximum Value Report date and time of any CFE measurement that exceeds CFE maximum limit	At least every 4 hours*	5 NTU Contact state within 24 hours	1 NTU Contact state within 24 hours	1 NTU Contact state within 24 hours	
IFE Monitoring Report IFE monitoring conducted and any follow-up actions	Monitor continuously every 15 minutes	None	Monitor-exceedances require follow-up action. Systems wit or fewer filters may monitor CFE continuously in lieu of IF		

*Monitoring frequency may be reduced by the state to once per day for systems serving fewer than 500 people.

IFE Turbidity: Follow-Up and Reporting Requirements						
Condition	IESWTR (≥ 10,000)			LT1ESWTR (<10,000)**		
Condition	Action	Report	Ву	Action	Report	Ву
2 consecutive recordings > 0.5 NTU taken 15 minutes apart at end of first 4 hours of continuous filter operation after backwash/offline:	Produce filter profile within 7 days (if unknown cause).	 Filter # Turbidity value Date Cause (if known) or report profile was produced 	10 th of the following month			
2 consecutive recordings > 1.0 NTU taken 15 minutes apart:	Produce filter profile within 7 days (if unknown cause).	 Filter # Turbidity value Date Cause (if known) or report profile was produced 	10 th of the following month		 Filter # Turbidity value Date Cause (if known) 	10 th of the following month
2 consecutive recordings > 1.0 NTU taken 15 minutes apart at the same filter for 3 months in a row :	Conduct filter self-assessment within 14 days.	 Filter # Turbidity value Date Report filter self-assessment produced 	10 [™] of the following month	Conduct a filter self-assessment within 14 days Systems with 2 filters that monitor CFE in lieu of IFE must do both filters.	Date filter assessment triggered & completed	10 th of the following month (or within 14 days of filter self- assessment being triggered if triggered in last 4 days of the month).
2 consecutive recordings > 2.0 NTU taken 15 minutes apart	Arrange for Comprehensive Performance Evaluation (CPE)	 Filter # Turbidity value Date 	10 th of the following month	Arrange for CPE within 60 days & submit CPE	Date CPE triggered	10 th of the following month
at the same filter for 2 months in a row:	within 30 days & submit report within 90 days.	Submit CPE report	90 days after exceedance	report within 120 days.	Submit CPE report	120 days after exceedance

** Systems serving fewer than 10,000 people had to begin complying with these requirements beginning January 1, 2005.

Filter Backwash Recycling Rule

The FBRR applies to Subpart H systems that practice conventional or direct filtration, and recycle spent filter backwash, thickener suernatant, or liquids from dewatering processes. The FBRR requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state. The FBRR was developed to improve public health protection by assessing and changing, where needed, recycle practices for improved contaminant control, particularly microbial contaminants. Systems were required to submit recycle notification to the state by December 8, 2003. By June 8, 2004, systems were required to return recycle flows through the processes of a system's existing conventional or direct filtration system or an alternate recycle location approved by the state and collect recycle flow information and retain on file. Any system making capital improvements to modify the recycle return location was given until June 8, 2006, to complete the improvements. All new systems must abide by these requirements.

Disinfection

Disinfection must be sufficient to ensure that the total treatment process (disinfection plus filtration) of the system achieves at least:

- ▶ 99.9% (3-log) inactivation and/or removal of Giardia lamblia.
- 99.99% (4-log) inactivation and/or removal of viruses.

Subpart H systems using chlorine dioxide, ozone, or ultraviolet (UV) disinfection may achieve additional *Cryptosporidium* log credit by using the Inactivation Toolbox option under the LT2ESWTR. Systems must also comply with the maximum residual disinfectant level (MRDL) and maximum contaminant level (MCL) requirements specified in the Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR) and Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR).

Residual Disinfectant Monitoring and Reporting Requirements				
Location	Concentration	Monitoring Frequency	Reporting (Reports due 10th of the following month)	
Entry to distribution system.	Residual disinfectant concentration cannot be < 0.2 mg/L for more than 4 hours.	Continuous, but states may allow systems serving \leq 3,300 to take grab samples from 1 to 4 times per day, depending on system size.	Lowest daily value for each day, the date and duration when residual disinfectant was < 0.2 mg/L, and when state was notified of events where residual disinfectant was < 0.2 mg/L.	
Distribution system - same location as total coliform sample location(s).	Residual disinfectant concentration cannot be undetectable in greater than 5% of samples in a month, for any 2 consecutive months. Heterotrophic plate count (HPC) ≤ 500/mL is deemed to have detectable residual disinfectant.	Same time as total coliform samples.	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5% of the measurements as being undetectable in any 2 consecutive months.	

LT2ESWTR Source Water Monitoring and Bin Classification

Bin concentration is calculated by averaging individual sample results from 1 or more years of monitoring (specific procedures vary by frequency and duration of monitoring).

A combined distribution system (CDS) is an interconnected distribution system consisting of the distribution systems of the wholesale system and of the consecutive systems that receive finished water from that wholesale system. Under the LT2ESWTR, wholesale systems in a CDS must comply with the LT2ESWTR based on the population of the largest system in their CDS.

EPA has established four schedule categories based on system size to simplify the discussion of the LT2ESWTR monitoring requirements. Schedule 1 applies to systems that serve 100,000 or more people or in a CDS that largest system serves 100,000 people. Schedule 2 applies to systems that serve 50,000 to 99,999 people or in a CDS that largest system serves 50,000 to 99,999 people. Schedule 3 applies to systems that serve 10,000 and 49,999 people or in a CDS that largest system serves 10,000 and 49,999 people. Schedule 4 applies to systems that serve less than 10,000 people.

Source water monitoring requirements are as follows:

- ► Large systems (≥ 10,000 people served) must sample for Cryptosporidium, E.coli and turbidity at least monthly for 2 years.
- Small systems (< 10,000 people served) must initially sample for *E.coli* at least once every 2 weeks for 1 year. *Cryptosporidium* monitoring is only required if *E. coli* levels are above certain levels based on the water source type.
- ► All systems must begin a second round of monitoring 6 years after initial bin classification.

Bin Classification and Additional Treatment Requirements			
Bin Cryptosporidium		Additional Treatment Requirements*	
ЫП	Bin Concentration	Conventional Filtration	Direct Filtration
Bin 1	Less than .075 oocysts/ L **	No additional treatment	No additional treatment
Bin 2	.075 oocysts/L or higher, but less than 1.0 oocysts/L	1-log treatment***	1.5-log treatment***
Bin 3	1.0 oocysts or higher, but less than 3.0 oocysts/L	2-log treatment***	2.5-log treatment***
Bin 4	3.0 oocysts or higher	2.5 log treatment***	3-log treatment***

* Requirements in addition to those met in full compliance with SWTR, IESWTR, and LT1ESWTR

*** Removal or inactivation

^{**} Or Subpart H systems not required to monitor for Cryptosporidium

Microbial Toolbox: Inactivation Options, Credits and Criteria

The Microbial Toolbox provides a list of the tools that systems can use, and receive treatment credits for, in order to meet additional treatment requirements of LT2ESWTR. The toolbox provides systems with the flexibility to use any combination of applicable treatment options as long as the systems are in compliance with design, operational, and performance criteria which are not detailed in this document. The toolbox options and credits available for Subpart H systems are divided into five categories:

- Source protection and management: watershed control program (0.5-log), alternative source/intake management (no
 prescribed credit).
- Prefiltration: presedimentation basin with coagulation (0.5-log), two-stage lime softening (0.5-log), bank filtration (0.5- or 1-log).
- Treatment performance: combined filter performance (0.5-log), individual filter performance (0.5-log), demonstration of performance (log credit variable).
- Additional filtration: bag and cartridge filters individual (up to 2-log), bag and cartridge filters in series (up to 2.5-log), membrane filtration (log credit variable), second stage filtration (0.5-log), slow sand filters (2.5- to 3-log).
- Inactivation: chlorine dioxide (log credit variable), ozone (log credit variable), UV (log credit variable).

Disinfection Profiling and Benchmarking Requirements

A disinfection profile is the graphical representation of a system's microbial inactivation over 12 consecutive months.

A **disinfection benchmark** is the lowest monthly average microbial inactivation value. The disinfection benchmark is used as a baseline of inactivation when considering changes in the disinfection process.

Disinfection Profiling and Benchmarking Requirements

The purpose of disinfection profiling and benchmarking is to allow systems and states to assess whether a change in disinfection practices reduces microbial protection. Systems must develop a disinfection profile that reflects *Giardia lamblia* and viruses inactivation, calculate a benchmark (lowest monthly inactivation) based on the profile, and consult with the state prior to making a significant change to disinfection practices.

Requirement	IESWTR	LT1ESWTR	LT2ESWTR
Affected Systems:	Community water systems (CWS), nontransient noncommunity water systems (NTNCWS), and transient noncommunity water systems (TNCWS) ≥ 10,000.	CWS and NTNCWS <10,000 only.	Any CWS, NTNCWS or TNCWS that proposes to make a significant change in disinfection practice*.
Begin Profiling By:	April 1, 2000	 July 1, 2003, for systems serving 500-9,999 people. January 1, 2004, for systems serving < 500 people. 	 Upon completion of initial round of source water monitoring, AND 12 consecutive months prior to making the proposed change.
Frequency & Duration:	Daily monitoring for 12 consecutive calendar months to determine the total logs of <i>Giardia</i> <i>lamblia</i> inactivation (and viruses, if necessary) for each day in operation.	Weekly inactivation of <i>Giardia</i> <i>lamblia</i> (and viruses, if necessary), on the same calendar day each week over 12 consecutive months.	At least weekly inactivation of <i>Giardia lamblia</i> and viruses, for at least 1 year. May use data collected for profile under IESWTR or LT1ESWTR.
States May Waive Disinfection Profiling Requirements If:	 TTHM annual average < 0.064 mg/L and HAA5 annual average < 0.048 mg/L: Collected during the same period. Annual average is arithmetic average of the quarterly averages of 4 consecutive quarters of monitoring. At least 25% of samples at the maximum residence time in the distribution system. Remaining 75% of samples at representative locations in the distribution system. 	 One TTHM sample < 0.064 mg/L and one HAA5 sample < 0.048 mg/L: Collected during the month of warmest water temperature; AND At the maximum residence time in the distribution system. Samples must have been collected after January 1, 1998. 	 The system has an existing disinfection profile for both <i>Giardia lamblia</i> and viruses, and has neither made a significant change to its treatment practices nor changed sources since the profile was developed; OR, The system has at least 1 year of existing data that can be used to complete a disinfection profile, and has neither made a significant change to its treatment practice nor changed sources since the data were collected.
Disinfection Benchmark Must be Calculated If:	 Systems required to develop a disinfection profile and are considering making a significant changes in disinfection practice*. Systems must consult the state prior to making any modifications to disinfection practices. 	Same as IESWTR, and systems must obtain state approval prior to making any modifications to disinfection practices.	Complete disinfection profile and benchmark for viruses and Giardia lamblia.

*A significant change in disinfection practice is defined as (1) change in the point of disinfection, (2) change to the type of disinfectant, (3) change to the disinfection process, or (4) any other modification designated by the state.





For additional information on the PN Rule

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA Web site at <u>http://water.</u> <u>epa.gov/drink</u>; or contact your state or local primacy agency's drinking water representative. Log onto the PNiWriter Web site to use EPA's templates at <u>www.PNiWriter.com</u>.

The Public Notification Rule: A Quick Reference Guide

Overview of the Rule

Title*	Public Notification (PN) Rule, 65 FR 25982, May 4, 2000.
Purpose	To notify the public of drinking water violations or situations that may pose a risk to public health.
General Description	The PN Rule requires all public water systems (PWSs) to notify their consumers any time a PWS violates a national primary drinking water regulation or has a situation posing a risk to public health. Notices must be provided to persons served (not just billing customers).
Utilities Covered	All PWSs.
Timing and Distribution	Notices must be sent within 24 hours, 30 days, or one year depending on the tier to which the violation is assigned. The clock for notification starts when the PWS learns of the violation.

*This document provides a summary of federal drinking water requirements; to ensure full compliance, please consult the federal regulations at 40 CFR 141 and any approved state requirements.

Tier 1 (Immediate Notice, Within 24 Hours)

Tier 1 PN is required to be issued as soon as practical but no later than 24 hours after the PWS learns of the violation or situation including:

- Distribution system sample violation when fecal coliform or *E. coli* are present; failure to test for fecal coliform or *E. coli* after initial total coliform distribution system sample tests positive.
- Nitrate, nitrite, or total nitrate and nitrite maximum contaminant level (MCL) violation; failure to take confirmation sample.
- ► Special notice for noncommunity water systems (NCWSs) with nitrate exceedances between 10 mg/L and 20 mg/L, where system is allowed to exceed 10 mg/L by primacy agency.
- Chlorine dioxide maximum residual disinfectant level (MRDL) violation when one or more of the samples taken in the distribution system exceeds the MRDL on the day after a chlorine dioxide measurement taken at the entrance to the distribution system exceeds the MRDL, or when required samples are not taken in the distribution system.
- Exceedance of maximum allowable turbidity level, if elevated to a Tier 1 notice by primacy agency.
- Waterborne disease outbreak or other waterborne emergency.
- Detection of *E. coli*, enterococci, or coliphage in a ground water source sample.
- Other violations or situations determined by the primacy agency.

Tier 2 (Notice as Soon as Practical, Within 30 Days)

Tier 2 PN is required to be issued as soon as practical or within 30 days. Repeat notice every 3 months until violation or situation is resolved.

- All MCL, MRDL, and treatment technique violations, except where Tier 1 notice is required.
- Monitoring violations, if elevated to Tier 2 notice by primacy agency.
- Failure to comply with variance and exemption conditions.
- For ground water systems providing 4-log treatment and conducting Ground Water Rule (GWR) compliance monitoring, failure to maintain required treatment for more than 4 hours.
- Failure to take any required corrective action or be in compliance with a corrective action plan for a fecal indicator-positive ground water source sample.
- Failure to take any required corrective action or be in compliance with a corrective action plan for a significant deficiency under the GWR.
- Special public notice for repeated failure to conduct monitoring for Cryptosporidium.

Turbidity consultation is required when a PWS has a treatment technique violation resulting from a single exceedance of the maximum allowable turbidity limit or an MCL violation resulting from an exceedance of the 2-day turbidity limit. The PWS must consult their primacy agency within 24 hours. Primacy agencies will then determine whether a Tier 1 PN is necessary. If consultation does not occur within 24 hours, violations are automatically elevated to require Tier 1 PN.

Tier 3 (Annual Notice)

Tier 3 PN is required to be issued within 12 months and repeated annually for unresolved violations.

- All monitoring or testing procedure violations, unless primacy agency elevates to Tier 2, including failure to conduct benchmarking and profiling (surface water systems) and failure to develop a monitoring plan (disinfecting systems).
- Operating under a variance and exemption.
- Special public notice for availability of unregulated contaminant monitoring results.
- Special public notice for fluoride secondary maximum contaminant level (SMCL) exceedance.

Ten Required Elements of a Public Notice

Unless otherwise specified in the regulations,* each notice must contain:

- 1. Description of the violation or situation, including the contaminant(s) of concern, and (as applicable) the contaminant level(s).
- 2. When the violation or situation occurred (i.e., date the sample was collected or was supposed to be collected).
- Any potential adverse health effects from drinking the water and standard language regarding the violation or situation. (For MCL, MRDL, treatment technique violations, or violations of the conditions of a variance or exemption, use health effects language from Appendix B of the PN Rule. For monitoring and testing procedure violations, use the standard monitoring language below.)
- 4. The population at risk, including subpopulations that may be particularly vulnerable if exposed to the contaminant in their drinking water.
- 5. Whether alternate water supplies should be used.
- 6. Actions consumers should take, including when they should seek medical help, if known.
- 7. What the PWS is doing to correct the violation or situation.
- 8. When the PWS expects to return to compliance or resolve the situation.
- 9. The name, business address, and phone number or those of a designee of the PWS as a source of additional information concerning the notice.
- 10. A statement (see standard distribution language below) encouraging notice recipients to distribute the notice to others, where applicable.

* These elements do not apply to notices for fluoride SMCL exceedances, availability of unregulated contaminant monitoring data, and operation under a variance or exemption. Content requirements for these notices are specified in the PN Rule.

Standard Language:

Standard Monitoring Language: We are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not our drinking water meets health standards. During [period] we [did not monitor or test/did not complete all monitoring or testing] for [contaminant(s)], and therefore cannot be sure of the quality of the drinking water during that time.

Standard Distribution Language: Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

Multilingual Requirements

Where the PWS serves a large proportion of non-English speakers, the PWS must provide information in the appropriate language(s) on the importance of the notice or on how to get assistance or a translated copy.

Presentation and Distribution

- The Tier 1 PN must be issued via radio, TV, hand delivery, posting, or other method specified by the primacy agency to reach all persons served. PWSs must also initiate consultation with the primacy agency within 24 hours. Primacy agency may establish additional requirements during consultation.
- The Tier 2 and Tier 3 PNs must be issued by Community Water Systems (CWSs) via mail or direct delivery and by NCWSs via posting, direct delivery, or mail. Primacy agencies may permit alternate methods. All PWSs must use additional delivery methods reasonably calculated to reach other consumers not notified by the first method.*
- Notices for individual violations can be combined into an annual notice (including the Consumer Confidence Report [CCR], if PN requirements can still be met).
- Each PN:
 - Must be displayed in a conspicuous way.
 - Must not include overly technical language or very small print.
 - Must not be formatted in a way that defeats the purpose of the notice.
 - Must not include language that nullifies the purpose of the notice.
- If the notice is posted, it must remain in place for as long as the violation or situation persists, but in no case for less than seven days, even if the violation or situation is resolved.

*PWSs should check with their primacy agency to determine the most appropriate delivery methods.

Notices to New Customers

All new billing units and customers must be notified of ongoing violations or situations requiring PN.

Reporting and Recordkeeping

- > PWSs have 10 days to send a certification of compliance and a copy of the completed notice to the primacy agency.
- PWS and primacy agency must keep notices on file for 3 years.

The Required Elem	ents of a Public Notice	
	IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER	
	Tests Showed Presence of Coliform Bacteria	
2. When the violation occurred	The Jonesville Water System routinely monitors for coliform bacteria. During the month of July, 7 percent of our samples tested positive. The standard is that no more than 5 percent of samples may test positive.	1. Description of the violation
6. Actions consumers should take	What should I do?	
	• You do not need to boil your water or take other corrective actions. However, if you have specific health concerns, consult your doctor.	5. Should alternate water supplies be
	You do not need to use an alternate (e.g., bottled) water supply.	used
	 People with severely compromised immune systems, infants, pregnant women, and some elderly may be at increased risk. These people should seek advice about drinking water from their health care providers. General guidelines on ways to lessen the risk of infection by microbes are available from EPA's Safe Drinking Water Hotline at 1-800-426-4791. 	4. The population at ← risk
	What does this mean?	
3. Potential adverse health effect s	This is not an emergency. If it had been, you would have been notified immediately. Coliform bacteria are generally not harmful themselves. <i>Coliforms</i> <i>are bacteria which are naturally present in the environment and are used as</i> <i>an indicator that other, potentially-harmful, bacteria may be present. Coliforms</i> <i>were found in more samples than allowed and this was a warning of potential</i> <i>problems.</i>	
7. What is being done to correct the	Usually, coliforms are a sign that there could be a problem with the system's treatment or distribution system (pipes). Whenever we detect coliform bacteria in any sample, we do follow-up testing to see if other bacteria of greater concern, such as fecal coliform or <i>E. coli</i> , are present. We did not find any of these bacteria in our subsequent testing.	
violation or situation	What was done?	
	We took additional samples for coliform bacteria which all came back negative. As an added precaution, we chlorinated and flushed the pipes in the distribution system to make sure bacteria were eliminated. This situation is now resolved.	8. When the system expects to return to compliance
	For more information, or to learn more about protecting your drinking water please contact John Jones at (502) 555-1212.	9. Phone number for
10. Required distribution language ——	Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.	
	This is being sent by the Jonesville Water System.	
	State Water System ID#1234567. Date Distributed: 8/8/09	





Radionuclides Rule: A Quick Reference Guide

Overview of the Rule		
Title*	Radionuclides Rule 66 FR 76708 December 7, 2000 Vol. 65, No. 236	
Purpose	Reducing the exposure to radionuclides in drinking water will reduce the risk of cancer. This rule will also improve public health protection by reducing exposure to all radionuclides.	
General Description	The rule retains the existing MCLs for combined radium-226 and radium-228, gross alpha particle radioactivity, and beta particle and photon activity. The rule regulates uranium for the first time.	
Utilities Covered	Community water systems, all size categories.	
*This document provides a summary of federal drinking water requirements; to ensure full compliance, please consult the federal regulations at 40 CFR 141 and any approved state requirements.		

Public Heal	th Benefits
Implementation of the Radionuclides Rule will result in	Reduced uranium exposure for 620,000 persons, protection from toxic kidney effects of uranium, and a reduced risk of cancer.
Estimated impacts of the Radionuclides Rule include	Annual compliance costs of \$81 million. Only 795 systems will have to install treatment.

Regulated Contaminants		
Regulated Radionuclide	MCL	MCLG
Beta/photon emitters**	4mrem/yr	0
Gross alpha particle	15 pCi/L	0
Combined radium- 226/228	5 pCi/L	0
Uranium	30µg/L	0
**A total of 168 individual beta particle and photon emitters may be used to calculate compliance with the MCL.		

Critical Deadlines & Requirements

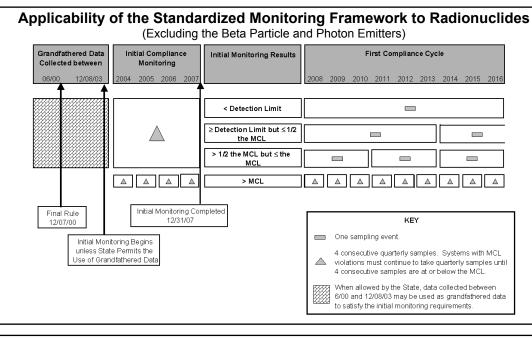
For Drinking Water Systems		
June 2000 - December 8, 2003	When allowed by the State, data collected between these dates may be eligible for use as grandfathered data (excluding beta particle and photon emitters).	
December 8, 2003	Systems begin initial monitoring under State-specified monitoring plan unless the State permits use of grandfathered data.	
December 31, 2007	All systems must complete initial monitoring.	
For States		
December 2000 - December 2003	States work with systems to establish monitoring schedules.	
December 8, 2000	States should begin to update vulnerability assessments for beta photon and particle emitters and notify systems of monitoring requirements.	
Spring 2001	EPA meets and works with States to explain new rules and requirements and to initiate adoption and implementation activities.	
December 8, 2002	State submits primacy revision application to EPA. (EPA approves within 90 days.)	

Gross Alpha, Combined Radium-226/228, and Uranium (1)	Beta Particle and Photon Radioactivity (1)
Initial Monitoring	
Four consecutive quarters of monitoring.	No monitoring required for most CWSs. Vulnerable CWSs (2) must sample for: • Gross beta: quarterly samples. • Tritium and Strontium-90: annual sample
Reduced Monitoring	
If the average of the initial monitoring results for each contaminant is below the detection limit: One sample every 9 years. If the average of the initial monitoring results for each contaminant is greater than or equal to the detection	If the running annual average of the gross be particle activity minus the naturally occurring potassium-40 activity is less than or equal to pCi/L: One sample every 3 years.
contaminant is greater than or equal to the detection limit, but less than or equal to one-half the MCL: One sample every 6 years.	
If the average of the initial monitoring results for each contaminant is greater than one-half the MCL, but less than or equal to the MCL: One sample every 3 years.	
Increased Monitoring	
A system with an entry point result above the MCL must return to quarterly sampling until 4 consecutive quarterly samples are below the MCL.	If gross beta particle activity minus the naturally occurring potassium-40 activity exceeds 50 pCi/L, the system must: • Speciate as required by the State. • Sample at the initial monitoring frequency.
(1) All samples must be collected at each entry point to the distr (2) The rule also contains requirements for CWSs using waters	

Grandfathering of Data

When allowed by the State, data collected between June, 2000 and December 8, 2003 may be used to satisfy the initial monitoring requirements if samples have been collected from:

- Each entry point to the distribution system (EPTDS).
- The distribution system, provided the system has a single EPTDS.
- The distribution system, provided the State makes a written justification explaining why the sample is representative of all EPTDS.



For additional information on the Radionuclides Rule

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA Web site at http://water.epa.gov/drink.



Record Keeping Rules: A Quick Reference Guide

	Introduction
Purpose	 This Guide will help you better understand: What records you are required to keep. The types of system information and additional records you should keep. How long this information should be retained to maintain a comprehensive history of your public water system (PWS). The benefits of record keeping. How to keep your records secure.
Target Audience	This guide is intended for owners and operators of all PWSs serving fewer than 10,000 persons.

Benefits of Record Keeping

Record keeping has many benefits and can help you improve the operation and management of your system. Some benefits of recordkeeping are:

- Records are a simple, easy, and cost-effective management tool.
- Complete, well-organized records can help ensure proper system operation and maintenance of facilities and equipment, helping facilities run more efficiently.
- Accurate records can help to educate new staff, guide all staff in recognizing and diagnosing problems, and provide possible solutions.
- Records can help resolve customer complaints.
- Records document changes that occur in water use, water quality, and water availability.
- Records can help facilitate communication with customers, regulators, and decision makers.
- Financial records can help determine if revenues are covering costs, help plan for the future, and assist in compiling information for required reports.

All	PWSs Must Keep Records of	Frequency
•	Actions taken by your system to correct violations of primary drinking water regulations (40 Code of Federal Regulations [CFR] 141.33).	At least 3 years
•	Public notices that your system issues (40 CFR 141.33).	
*	Microbiological and turbidity analyses (40 CFR 141.33). ² You may maintain actual laboratory results or a summary of these results. (See 40 CFR 141.33 for specific requirements.) Groundwater systems may not be required to keep turbidity records.	At least 5 years
•	Variances or exemptions (40 CFR 141.33).	
•	Chemical analyses (e.g., disinfectant residuals; disinfection byproducts; nitrate/nitrite; radionuclides; inorganic, volatile organic, and synthetic organic compounds) ² (40 CFR 141.33). You may maintain actual laboratory results or a summary of these results. (See 40 CFR 141.33 for specific requirements.)	At least 10 years
•	Sanitary surveys and written reports and summaries of sanitary surveys (40 CFR 141.33).	

In addition to the requirements listed on the previous page, some Rules have more extensive record keeping requirements. These requirements and the systems to which they apply are listed below.

Additional Rule Specific Record Keeping Requirements			
Rule	If You Are	You Must Keep	Frequency
Public Notification Rule	A PWS	Any public notification issued (40 CFR 141.33(e))	At least 3 years
Consumer Confidence Rule	A community water system (CWS)	Consumer Confidence Reports (40 CFR 141.155(h))	At least 3 years
	A CWS or nontransient noncommunity water system (NTNCWS) that has had a lead action level exceedance (ALE)	Records of Public Education for a lead ALE (40 CFR 141.91)	At least 12 years
Lead and Copper Rule	A CWS or NTNCWS	Records of all lead and copper results, including water quality parameters, source water sampling results, corrosion control recommendations and studies, public education materials, state determinations, schedules, letters, and evaluations (40 CFR 141.91)	At least 12 years
Phase II/V Rules	No additional rule specific record keepin	g requirements.	
Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR)	A CWS or NTNCWS that adds a disinfectant during any part of the treatment process or a TNCWS using chlorine dioxide	Stage 1 DBPR monitoring plans (40 CFR 141.33(f))	At least 10 years
Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR)	A CWS or NTNCWS that adds and/or delivers water treated with a primary or residual disinfectant other than ultraviolet light	Stage 2 DBPR (Subpart V) monitoring plans and analytical results (40 CFR 141.629(b))	At least 10 years
Surface Water Treatment Rule	No additional rule specific record keeping requirements.		
Interim Enhanced Surface Water Treatment Rule	This rule is not covered by this Quick Reference Guide because it applies to systems serving greater than 10,000 persons.		erving
Long Term 1 Enhanced Surface Water Treatment	A PWS using surface water or groundwater under the direct influence of surface water (GWUDI) sources	Results from disinfection profiling and benchmarking (including raw data and analysis), if you were required to develop a disinfection profile and benchmark (40 CFR 141.571)	Indefinitely
Rule (LT1ESWTR)	A PWS using surface water or GWUDI sources and using conventional or direct filtration	Individual filter monitoring results (40 CFR 141.571)	At least 3 years

In addition to the requirements listed on the first page, some Rules have more extensive record keeping requirements. These requirements and the systems to which they apply are listed below.

Additional Rule Specific Record Keeping Requirements (continued)			
Rule	If You Are	You Must Keep	Frequency
Long Term 2 Enhanced Surface		Results from initial source water monitoring and the second round of source water monitoring	At least 3 years after bin classification for filtered systems and after determination of mean <i>Crypto</i> level for unfiltered systems
Water Treatment	A subpart H PWS supplied by surface water or GWUDI sources	OR	OR
Rule (LT2ESWTR)		Notification to the state that you will not conduct source water monitoring under the LT2ESWTR because your system meets the criteria under 40 CFR 141.701(d)	At least 3 years
		Results of treatment monitoring associated with microbial toolbox options and uncovered finished water reservoirs required under the LT2ESWTR, if applicable (40 CFR 141.722)	At least 3 years
	A PWS that recycles spent filter backwash water, thickener supernatant, or liquids from dewatering processes	A copy of the recycle notification and information submitted to the state (40 CFR 141.76(d))	Indefinitely
		A list of all recycle flows and the frequency with which they are returned (40 CFR 141.76(d))	Indefinitely
		Average and maximum backwash flow rate through the filters (40 CFR 141.76(d))	Indefinitely
		Average and maximum duration of the filter backwash process in minutes (40 CFR 141.76(d))	Indefinitely
Filter Backwash Recycling Rule		A typical filter run length and a written summary of how filter run length is determined (40 CFR 141.76(d))	Indefinitely
		The type of treatment provided for recycle flow (40 CFR 141.76(d))	Indefinitely
		If applicable, data on the physical dimensions of the treatment and/or equalization units, typical and maximum hydraulic loading rates, type of treatment chemicals used and average dose and frequency of use, and the frequency at which solids are removed (40 CFR 141.76(d))	Indefinitely

What Additional Records Should My System Keep on File?

Records you may want to keep include:

- Information on system infrastructure (e.g., up-to-date as built engineering drawings, maps of valve and hydrant locations, pipe sizes and locations, permits, etc.).
- Equipment purchase and repair records.
- Operations and routine maintenance log sheets.
- Locations and dates of leak repairs.
- Records related to water treatment, including filter backwash logs, turbidity readings that are taken in addition to those required by regulation, coagulation records, and corrosivity control records.
- Records of chemical purchases.
- Records on source production, including static and pumping water levels, flow, and water use.
- Records of customer complaints, reason for the complaints, findings, and resolution.
- Public meeting and board meeting minutes.
- Records of operator certifications.
- Correspondence with regulators.
- Meter reading reports.
- Financial information, including budgets and customer billing records.

Contact your state primacy agency for additional information on other records your system should keep on file.

Issues to Consider About the Generation and Storage of Records		
	 Limit access to sensitive information to authorized individuals, but make it available to employees who may need it. 	
	 Keep hard copy sensitive information locked and ensure that only authorized personnel have access. 	
	 Install and maintain firewalls on network computers, or ensure that computers with sensitive information are not connected to a network or the internet. 	
Records Security	 Install and regularly run virus scans on networks and individual computers. 	
	Use passwords to control access to data.	
	 Install and maintain a back-up power supply so that information may be accessed during a power failure. 	
	 Maintain a back-up of sensitive electronic information in the event of an emergency. Also keep copies of sensitive hard copy information. Store both electronic and hard copy duplicates in a secure off-site location. 	
Record	 Develop a hard copy or electronic filing system to ensure efficient access to data. 	
Retention and Destruction Processes	• Ensure that there is a satisfactory way to destroy electronic and hard copy files that contain sensitive information (e.g., shred paper copies, erase old hard drives, and destroy other electronic media).	

For additional information:

Call the Safe Drinking Water Hotline at 1-800-426-4791, visit the EPA Web site at www.epa.gov/safewater/, or contact your state drinking water representative.





Overview of the Rule		
Title ¹	Total Coliform Rule (TCR) 54 FR 27544-27568, June 29, 1989, Vol. 54, No. 124 ²	
Purpose	Improve public health protection by reducing fecal pathogens to minimal levels through control of total coliform bacteria, including fecal coliforms and <i>Escherichia coli</i> (<i>E. coli</i>).	
General Description	Establishes a maximum contaminant level (MCL) based on the presence or absence of total coliforms, modifies monitoring requirements including testing for fecal coliforms or <i>E. coli</i> , requires use of a sample siting plan, and also requires sanitary surveys for systems collecting fewer than five samples per month.	
Utilities Covered	The TCR applies to all public water systems.	

Public Health Benefits

What are the Major Provisions? **ROUTINE** Sampling Requirements

- Total coliform samples must be collected at sites which are representative of water quality throughout the distribution system according to a written sample siting plan subject to state review and revision
- ► Samples must be collected at regular time intervals throughout the month except groundwater systems serving 4,900 persons or fewer may collect them on the same day.
- Monthly sampling requirements are based on population served (see table on next page for the minimum sampling frequency).
- A reduced monitoring frequency may be available for systems serving 1,000 persons or fewer and using only ground water if a sanitary survey within the past 5 years shows the system is free of sanitary defects (the frequency may be no less than 1 sample/quarter for community and 1 sample/ year for non-community systems).
- Each total coliform-positive routine sample must be tested for the presence of fecal coliforms or E. coli.
- If any routine sample is total coliform-positive, repeat samples are required.

REPEAT Sampling Requirements

- Within 24 hours of learning of a total coliform-positive ROUTINE sample result, at least 3 REPEAT samples must be collected and analyzed for total coliforms:
 - One REPEAT sample must be collected from the same tap as the original sample.
 - One REPEAT sample must be collected within five service connections upstream.
- One REPEAT sample must be collected within five service connections downstream.
 - Systems that collect 1 ROUTINE sample per month or fewer must collect a 4th REPEAT sample.
- If any REPEAT sample is total coliform-positive:
 - The system must analyze that total coliform-positive culture for fecal coliforms or E.coli.
 - The system must collect another set of REPEAT samples, as before, unless the MCL has been violated and the system has notified the state.

Additional ROUTINE Sample Requirements

A positive ROUTINE or REPEAT total coliform result requires a minimum of five ROUTINE samples be collected the following month the system provides water to the public unless waived by the state.

This document provides a summary of federal drinking water requirements; to ensure full compliance, please consult the federal regulations at 40 CFR 141 and any approved state requirements.

² The June 1989 Rule was revised as follows: Corrections and Technical Amendments, 6/19/90 and Partial Stay of Certain Provisions (Variance Criteria) 56 FR1556-1557, Vol 56, No 10.

Note: The TCR is currently undergoing the 6 year review process and may be subject to change.



Population	Minimum Samples/ Month	Population	Minimum Samples/ Month	Population	Minim Sampl Mont
25-1,000*	1	21,501-25,000	25	450,001-600,000	210
1,001-2,500	2	25,001-33,000	30	600,001-780,000	240
2,501-3,300	3	33,001-41,000	40	780,001-970,000	270
3,301-4,100	4	41,001-50,000	50	970,001-1,230,000	300
4,101-4,900	5	50,001-59,000	60	1,230,001-1,520,000	330
4,901-5,800	6	59,001-70,000	70	1,520,001-1,850,000	360
5,801-6,700	7	70,001-83,000	80	1,850,001-2,270,000	390
6,701-7,600	8	83,001-96,000	90	2,270,001-3,020,000	420
7,601-8,500	9	96,001-130,000	100	3,020,001-3,960,000	450
8,501-12,900	10	130,001-220,000	120	≥ 3,960,001	480
12,901-17,200	15	220,001-320,000	150		
17,201-21,500	20	320,001-450,000	180		

What are the Other Provisions?

what are the other rigorbiols.				
Systems collecting fewer than 5 ROUTINE samples per month	Must have a sanitary survey every 5 years (or every 10 years if it is a non-community water system using protected and disinfected ground water).**			
Systems using surface water or ground water under the direct influence of surface water (GWUDI) and meeting filtration avoidance criteria	Must collect and have analyzed one coliform sample each day the turbidity of the source water exceeds 1 NTU. This sample must be collected from a tap near the first service connection.			

** As per the IESWTR, states must conduct sanitary surveys for community surface water and GWUDI systems in this category every 3 years (unless reduced by the state based on outstanding performance).

How is Compliance Determined?

- Compliance is based on the presence or absence of total coliforms.
- Compliance is determined each calendar month the system serves water to the public (or each calendar month that sampling occurs for systems on reduced monitoring).
- The results of ROUTINE and REPEAT samples are used to calculate compliance.

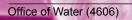
A Monthly MCL Violation is Triggered if:				
A system collecting fewer than 40 samples per month	Has greater than 1 ROUTINE/REPEAT sample per month which is total coliform-positive.			
A system collecting at least 40 samples per month	Has greater than 5.0 percent of the ROUTINE/REPEAT samples in a month total coliform-positive.			
An Acute MCL Violation is Triggered if:				

Any public water system . . .

Has any fecal coliform- or *E. coli*-positive REPEAT sample or has a fecal coliform- or *E. coli*-positive ROUTINE sample followed by a total coliform-positive REPEAT sample.

What are the Public Notification and Reporting Requirements?				
For a Monthly MCL Violation	The violation must be reported to the state no later than the end of the next business day after the system learns of the violation.			
	The public must be notified within 30 days after the system learns of the violation.			
For an Acute MCL Violation	The violation must be reported to the state no later than the end of the next business day after the system learns of the violation.			
	The public must be notified within 24 hours after the system learns of the violation.			
Systems with ROUTINE or REPEAT samples that are fecal coliform- or <i>E. coli</i> -positive	Must notify the state by the end of the day they are notified of the result or by the end of the next business day if the state office is already closed.			
ED4 040 E 04 005	http://www.basedowner.com/distribution			

EPA 816-F-01-035



representative.



Call the Safe Drinking Water Hotline at 1-800-426-4791; visit

the EPA web site at http://water.epa.gov/drink; or contact your state drinking water

the TCR



Revised Total Coliform Rule: A Quick Reference Guide

Overview of the Rule

evenuer				
Title*	Revised Total Coliform Rule (RTCR) 78 FR 10269, February 13, 2013, Vol. 78, No. 30			
Purpose	Increase public health protection through the reduction of potential pathways of entry for fecal contamination into distribution systems.			
General Description	The RTCR establishes a maximum contaminant level (MCL) for <i>E. coli</i> and uses <i>E. coli</i> and total coliforms to initiate a "find and fix" approach to address fecal contamination that could enter into the distribution system. It requires public water systems (PWSs) to perform assessments to identify sanitary defects and subsequently take action to correct them.			
Utilities Covered	The RTCR applies to all PWSs.			

* This document provides a summary of federal drinking water requirements; to ensure full compliance, please consult the federal regulations at 40 CFR 141 and any approved state requirements.

Public Health Benefits

Implementation of the RTCR will result in:

- A decrease in the pathways by which fecal contamination can enter the drinking water distribution system.
 Reduction in fecal contamination *should* reduce the potential risk from all waterborne pathogens including
 - bacteria, viruses, parasitic protozoa, and their associated illnesses.

Critical Deadlines and Requirements

For Public Water Systems

For Public Water Systems		
<u>Before</u> April 1, 2016	 PWSs must develop a written sample siting plan that identifies the system's sample collection schedule and all sample sites, including sites for routine and repeat monitoring. PWSs monitoring quarterly or annually must also identify additional routine monitoring sites in their sample siting plans. Sample siting plans are subject to state review and revision. 	
Paginning	Sample siting plans are subject to state review and revision.	
<u>Beginning</u> April 1, 2016	PWSs must comply with the RTCR requirements unless the state selects an earlier implementation date.	
For State Dr	rinking Water Agencies	
<u>By</u> February 13, 2015	 State submits final primacy program revision package to the EPA Region, including: Adopted State Regulations. Regulation Crosswalk. 40 CFR 142.10 Primacy Update Checklist. 40 CFR 142.14 and 142.15 Reporting and Recordkeeping. 40 CFR 142.16 Special Primacy Requirements. Attorney General's Enforceability Certification. NOTE: EPA regulations allow states until February 13, 2015, for this submittal. An extension of up to 2 years may be requested by the state. 	
Before February 13, 2015	 State must submit a primacy program revision extension request if it does not plan to submit the final primacy program revision package by February 13, 2015. The state extension request is submitted to the EPA Region including all of the information required in 40 CFR 142.12(b): A schedule (not to exceed 2 years) for the submission of the final primacy program revision package. Justification that meets the federal requirements for an extension request. Confirmation that the state is implementing the RTCR within its scope of its current authorities and capabilities. An approved workload agreement with the EPA Region. 	
<u>No later than</u> February 13, 2017	For states with an approved extension, submit complete and final program revision package by the agreed upon extension date.	
What are the Major Provisions?		
Routine San	npling Requirements	
	amples must be collected by PWSs at sites which are representative of water quality	

- Initial colliform samples must be collected by PWSs at sites which are representative of water quality throughout the distribution system according to a written sample siting plan subject to state review and revision.
- For PWSs collecting more than one sample per month, collect total coliform samples at regular intervals throughout the month, except that ground water systems serving 4,900 or fewer people may collect all required samples on a single day if the samples are taken from different sites.

Routine Sampling Requirements (cont.)

- Each total coliform-positive (TC+) routine sample must be tested for the presence of *E. coli*.
- ▶ If any TC+ sample is also *E. coli*-positive (EC+), then the EC+ sample result must be reported to the state by the end of the day that the PWS is notified.
- ▶ If any routine sample is TC+, repeat samples are required.
 - PWSs on quarterly or annual monitoring must take a minimum of three additional routine samples (known as additional routine monitoring) the month following a TC+ routine or repeat sample.
- Reduced monitoring may be available for PWSs using only ground water and serving 1,000 or fewer persons that meet certain additional PWS criteria.

Repeat Sampling Requirements

1 1	0	•
Within 24 hours of		One repeat sample must be collected from the same tap as the original sample.
learning of a TC+ routine sample		One repeat sample must be collected from within five service connections upstream.
result, at least 3 repeat samples must		One repeat sample must be collected from within five service connections downstream.
be collected and analyzed for total coliform:		The PWS may propose alternative repeat monitoring locations that are expected to better represent pathways of contamination into the distribution system.
If one or more repeat		The TC+ sample must be analyzed for the presence of <i>E. coli</i> .
sample is TC+:		If any repeat TC+ sample is also EC+, then the EC+ sample result must be reported to the state by the end of the day that the PWS is notified.
		The PWS must collect another set of repeat samples, unless an assessment has been triggered and the PWS has notified the state.

Assessments and Corrective Action

The RTCR requires PWSs that have an indication of coliform contamination (e.g., as a result of TC+ samples, *E. coli* MCL violations, performance failure) to assess the problem and take corrective action. There are two levels of assessments (i.e., Level 1 and Level 2) based on the severity or frequency of the problem.

Purpose of Level 1 and Level 2 Assessments	 To find sanitary defects at the PWS including: Sanitary defects that could provide a pathway of entry for microbial contamination, or Sanitary defects that indicate failure (existing or potential) of protective barriers against microbial contamination. Guidance on how to conduct Level 1 and Level 2 Assessments and how to correct sanitary defects found during the Assessments can be found at: http://water.epa.gov/lawsregs/rulesregs/sdwa/tcr/regulation_revisions.cfm.
Deadline for Completing Corrective Actions	 When sanitary defects are identified during a Level 1 or Level 2 Assessment, they should be corrected as soon as possible to protect public health. The PWS must complete corrective actions by one of the following timeframes: No later than the time the assessment form is submitted to the state, which must be within 30 days of triggering the assessment, or Within state-approved timeframe which was proposed in the assessment form.

Level 1 Assessments

Conducting Level 1 Assessments	Performed by the PWS owner or operator each time a Level 1 Assessment is triggered.		
	Upon trigger of a Level 1 Assessment, the Level 1 Assessment form must be submitted within 30 days to the state.		
Level 1 Assessment Triggers	 Level 1 Assessment is triggered if any one of the following occurs: A PWS collecting fewer than 40 samples per month has 2 or more TC+ routine/ repeat samples in the same month. A PWS collecting at least 40 samples per month has greater than 5.0 percent of the routine/repeat samples in the same month that are TC+. A PWS fails to take every required repeat sample after any single TC+ sample. 		
Level 2 Assessments			
Conducting Level 2 Assessments	 Performed by the state or state-approved entity each time a Level 2 Assessment is triggered. The PWS is responsible for ensuring that the Level 2 Assessment is conducted regardless of the entity conducting the Level 2 Assessment. 		
	Upon trigger of a Level 2 Assessment, the Level 2 Assessment form must be submitted within 30 days to the state.		
Level 2 Assessment Triggers	 Level 2 Assessment is triggered if any one of the following occurs: A PWS incurs an <i>E. coli</i> MCL violation. A PWS has a second Level 1 Assessment within a rolling 12-month period. A PWS on state-approved annual monitoring has a Level 1 Assessment trigger in 2 consecutive years. 		



For additional information on the RTCR:

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA website at http://water.epa.gov/lawsregs/ rulesregs/sdwa/tcr/regulation_ revisions.cfm; or contact your state drinking water representative.

Seasonal System Provisions			
 The RTCR defines seasonal systems and specifies additional requirements for these types of PWSs: A seasonal system is defined as a non-community water system that is not operated as a PWS on a year-round basis and starts up and shuts down at the beginning and end of each operating season. 			
Start-up Procedures for Seasonal Systems	 At the beginning of each operating period, before serving water to the public, seasonal water systems must: Conduct state-approved start-up procedures. Certify completion of state-approved start-up procedures. An exemption from conducting state-approved start-up procedures may be available for seasonal systems that maintain pressure throughout the distribution system during non-operating periods. 		
	 Examples of state-approved start-up proceds serving water to the public, may include one Disinfection. Distribution system flushing. Sampling for total coliform and <i>E. coli</i>. Site visit by state. Verification that any current or historical 		
Routine Monitoring for Seasonal Systems	 The baseline monitoring frequency for seasonal systems is monthly. A reduced monitoring frequency may be available for seasonal systems that use ground water only and serve fewer than 1,000 persons. 		
Other Provisio	ons for the State Drinking	Water Agency	
Special Monitoring Evaluation	The state must perform a special monitoring evaluation at all ground water systems serving 1,000 or fewer persons during each sanitary survey to review the status of the PWS and to determine whether the sample sites and monitoring schedule need to be modified.		
Major Violatio	ons		
	A PWS will receive an <i>E. coli</i> MCL violation sample result with a routine/repeat TC+ or E		
	<i>E. coli</i> MCL Violation Occurs with the Following Sample Result Combination		
	Routine	Repeat	
E. coli MCL Violation	EC+	TC+	
	EC+	Any missing sample	
	EC+	EC+	
	TC+	EC+	
	TC+	TC+ (but no <i>E. coli</i> analysis)	
Treatment Technique Violation	 A PWS will receive a Treatment Technique violation when any of the following occur: Failure to conduct a Level 1 or Level 2 Assessment within 30 days of a trigger. Failure to correct all sanitary defects from a Level 1 or Level 2 Assessment within 30 days of a trigger or in accordance with the state-approved timeframe. Failure of a seasonal system to complete state-approved start-up procedures prior to serving water to the public. 		
Key Points for Public Water Systems to Remember			
 Find and correct sanitary defects as soon as you become aware of them. This can help reduce <i>E. coli</i> MCL violations, which trigger a Level 2 Assessment. This can help reduce TC+ sample results, which may trigger a Level 1 Assessment. 			
 Make sure to collect all routine and repeat samples as required. Timely and correct monitoring can help reduce triggering a Level 1 or Level 2 Assessment because: Failure to conduct repeat monitoring triggers a Level 1 Assessment. A Level 1 Assessment triggered twice within a certain timeframe triggers a Level 2 Assessment. 			