

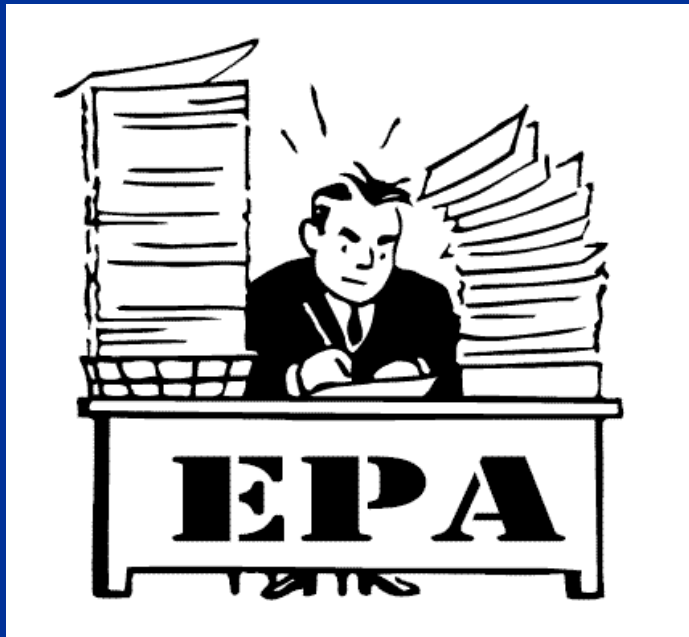
# The Groundwater Rule



Drinking Water Section

# The Basics

- 💧 EPA published GWR in Federal Register on Nov. 8, 2006
- 💧 Final Rule effective on Jan. 8, 2007.
- 💧 Compliance date for Rule requirements is December 1, 2009 (unless otherwise noted).



# The Basics

- 💧 Who does it apply to?
  - All groundwater public water systems, Community, NTNC and TNC
  - Mixed systems
  - Consecutive systems (purchased GW)
  - Not GWUDI
  - Not mixed GW/SW prior to treatment

# The Basics

## 💧 Why was it developed?

To provide PWSs that utilize groundwater with increased protection against microbial pathogens.

# The Basics

- 💧 The Ground Water Rule establishes a risk-targeted approach to target ground water systems that are susceptible to fecal contamination. The occurrence of fecal indicators in a drinking water supply is an indication of the potential presence of microbial pathogens that may pose a threat to public health.

# The Basics

- 💧 This rule requires ground water systems that are at risk of fecal contamination to take corrective action to reduce cases of illnesses and deaths due to exposure to microbial pathogens.

# The Basics

- 💧 So what systems are 'at risk'?
- 💧 How is that determination made?



# What are the Major Components?

1. Periodic sanitary surveys
2. Source water monitoring



(Well(s) determined to be 'at risk'?)



3. Corrective actions



# Sanitary Surveys

# Sanitary Surveys

- 💧 The GWR mandates periodic sanitary surveys of GW systems that require the evaluation of eight critical elements and the identification of significant deficiencies.

# Sanitary Surveys

- States must complete the initial survey by December 31, 2012 for most community water systems (CWSs) and by December 31, 2014 for CWSs with outstanding performance\* and for all non-community water systems.
- Most CWSs surveyed every 3 years, NCPWSs and some CWSs every 5 years

\* 4-log treatment installed or state defined outstanding performance record and no MCLs since last survey

# Sanitary Survey – 8 Elements

- 💧 source;
- 💧 treatment;
- 💧 distribution system;
- 💧 finished water storage;
- 💧 pumps, pump facilities, and controls;
- 💧 monitoring, reporting, and data verification;
- 💧 system management and operation; and
- 💧 operator compliance with state requirements.

# Sanitary Surveys – Significant Deficiencies

- 💧 PWS must correct significant deficiencies\*
- 💧 Significant deficiencies, include, but are not limited to, defects in design, operation, or maintenance, or a failure or malfunction of the sources, treatment, storage, or distribution system that the State determines to be causing, or have the potential for causing, the introduction of contamination into the water delivered to consumers.

\*as defined by the state

# Significant Deficiencies may include, but are not limited to the following:

## *Source*

- Well near a source of fecal contamination (e.g., failing septic systems or a leaking sewer line).
- Improperly constructed well (e.g., improper surface or subsurface seal).
- Well in a flood zone.

## *Treatment*

- Inadequate application of treatment chemicals (e.g., disinfection contact time is inadequate).
- Lack of redundant mechanical components where disinfection is required.
- Unprotected cross-connections with treatment chemical systems.
- Inadequate treatment process monitoring.

## *Distribution System*

- Negative pressures that could result in the entrance of contaminants.
- Unprotected cross-connections.
- Inadequate disinfectant residual monitoring, when required.

## *Finished Water Storage*

- Inadequate internal cleaning and maintenance of storage tanks.
- Storage tank roofs or covers need repair (e.g., holes or hatch of improper construction).
- Lack of proper screening of overflow pipes, drains, or vents.

## *Pumps, Pump Facilities, and Controls*

- Inadequate pump capacity.
- Inadequate maintenance.
- Inadequate/inoperable control system.

## *Monitoring, Reporting, and Data Verification*

- Failure to properly monitor water quality.
- Failure to meet reporting requirements.
- Inadequate recordkeeping.

## *System Management and Operation*

- Failure to meet water supply demands/interruptions to service (e.g., unreliable water source or lack of auxiliary power).
- Lack of approved emergency response plan.
- Inadequate follow-up to deficiencies noted in previous assessment/survey.

## *Operator Compliance with State Requirements*

- Lack of operator training.
- Operator is not certified as required by the State.

# Sanitary Surveys - Deadlines

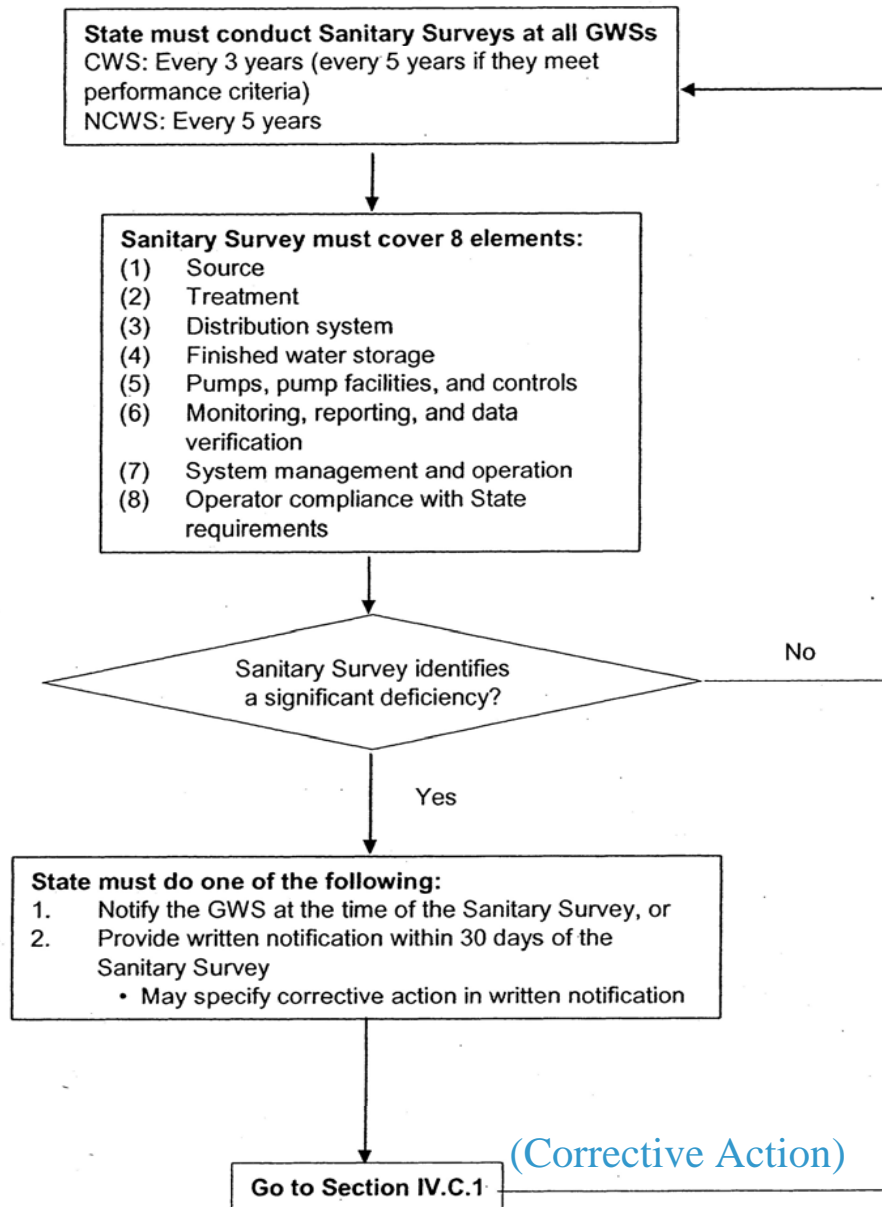
- 💧 State must provide PWS with written notification of deficiencies within 30 days.
- 💧 State may specify/recommend appropriate corrective actions
- 💧 30 day consultation period subsequent to notice
- 💧 State may prescribe corrective actions and completion dates, including immediate and/or interim corrective actions, in lieu of the consultation process.

# Sanitary Surveys - Deadlines

- 💧 GWS must complete 'Corrective Action'\* or be in compliance with a State-approved corrective action plan and schedule within 120 days of receiving written notice from the State.
- 💧 Failure to do so will result in a treatment technique violation.
- 💧 Rule requires systems to notify customers of uncorrected significant deficiencies.
- \* **GWR Rule defines 'Corrective Action' – explained later**



Figure IV-1: Sanitary Survey Requirements



# Source Water Monitoring

# Source water monitoring

- 💧 Source water monitoring will target and identify ‘at-risk’ systems by requiring them to test their wells for the presence of fecal indicators (*E. coli*, enterococci, or coliphage). There are two monitoring provisions:
  - 💧 *Triggered monitoring* - required
  - 💧 *Assessment monitoring* – optional (state)

## *Triggered monitoring*

- 💧 *Triggered monitoring* – system must sample source(s) within 24 hours following a total coliform-positive routine sample under Total Coliform Rule sampling in the distribution system.

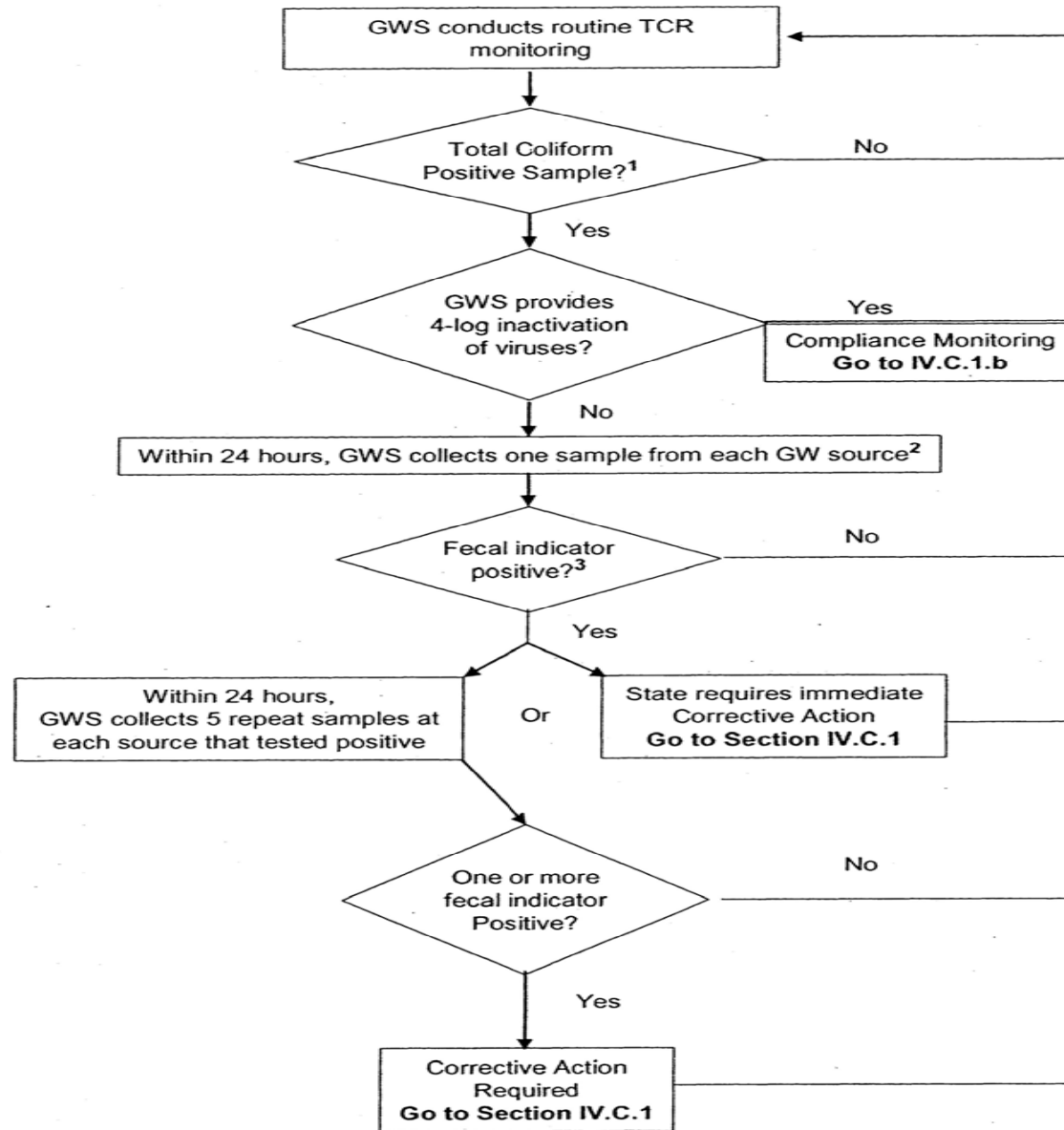
## *Triggered monitoring*

- 💧 When the triggered source water sample is positive for a fecal indicator, the water system must collect 5 additional source water samples within 24 hours unless immediate corrective action is required by the state.
- 💧 Water systems must respond to any fecal indicator positive source water sample using one of the acceptable corrective action options (see Treatment Technique Requirements).
- 💧 Water systems must do appropriate public notice. This is Tier 1 Public Notice when a triggered source water sample is positive for a fecal indicator.

# *Triggered monitoring*

- ◆ States may extend the 24 hour time limit on a case by case basis.
- ◆ **Systems with more than one ground water source may sample a representative source(s) if approved by the state.**
- ◆ Triggered monitoring does not apply if the water system provides at least 4-log virus inactivation and removal before the first customer.
- ◆ Triggered monitoring may be waived by the state if it determines and documents that the positive distribution sample is caused by a distribution system deficiency or that the sample was collected at a location with conditions that will cause total coliform positive samples.

**Figure IV-2: Triggered Source Water Monitoring Requirements**



<sup>1</sup>Answer "no" if the sample is invalidated under 141.21(c) or the State determines that the cause of the total coliform-positive sample directly relates to the distribution system

<sup>2</sup>If approved by the State, systems with more than one ground water source may monitor at representative ground water source(s) according to a triggered source water monitoring plan

<sup>3</sup>*E. coli*, enterococci, or coliphage

# *Assessment Monitoring*

- 💧 *Assessment monitoring* - As a complement to triggered monitoring, a State has the option to require systems, at any time, to conduct source water assessment monitoring to help identify high risk systems.



# *Assessment Monitoring*

- 💧 Assessment monitoring will be conducted as prescribed by the state. State requirements may include: monthly source monitoring; monitoring of all sources or representative sources; monitoring for any of the fecal indicators; monitoring at the well or at other points before or after treatment.

# What will prompt assessment monitoring?

- 💧 EPA recommends that states use Hydrogeologic Sensitivity Assessments (HSAs) and TCR/triggered source water monitoring results, along with other information to identify higher risk systems for assessment source water monitoring.

# What is an HSA?

- ◆ HSAs are determined using hydrogeologic data from the surrounding area. The first step in an HSA is to identify the aquifer from which the ground water system is drawing its water, where multiple aquifers are present. This requires accurate well construction records that provide the depth of the well, a record of the geologic strata encountered during the drilling, and an indication of the type and depth of well casing, grouting, and well screen installed. The second step in assessing the sensitivity of a system is to characterize the hydrogeology of the source aquifer (i.e., if the aquifer is in a karst, gravel, or fractured bedrock). The next step is to determine if the aquifer has a hydrogeologic barrier that would prevent the vertical movement of microbial contaminants from the surface into the aquifer. A confining layer, an example of a hydrogeologic barrier, is a layer of impermeable material such as clay, that is sufficiently thick and uniformly distributed to protect the underlying aquifer. The final step involves making a determination of the sensitivity of the well based upon the available information and to document this finding in an assessment report.

# Corrective Actions

A system has been identified as being 'at-risk' either by identification of a significant deficiency during the sanitary survey or a source water fecal indicator. Now what?

# Corrective actions

- Corrective actions are required for any system with a significant deficiency or source water fecal contamination. The system must implement one or more of the following correction action options:
  - correct all significant deficiencies,
  - eliminate the source of contamination,
  - provide an alternate source of water, or
  - provide treatment which reliably achieves 99.99 percent (4-log) inactivation or removal of viruses.

# What options does a system have for corrective actions?

- Correct All Significant Deficiencies  
Examples: repairs to wells, repairs to piping, tanks and treatment equipment, control of cross connections
- Provide An Alternate Source Of Water  
Examples: new well, connection to another PWS
- Eliminate The Source Of Contamination  
Examples: remove point sources, relocate pipelines and waste disposal, redirect drainage or run-off, provide or fix existing fencing or housing of the wellhead
- Provide Treatment That Reliably Achieves  $\geq 4$ -log Treatment Of Viruses  
Examples: using inactivation, removal, or a state-approved combination of 4-log virus inactivation and removal

## How can a PWS achieve 4-log removal?

- 💧 Treatment technologies capable of providing at least a 4-log treatment of viruses include the following:
  - 💧 Inactivation
  - 💧 Removal
  - 💧 Combination through alternative treatment technologies

# Inactivation (Chemical Disinfection)

- 💧 Inactivation, with a sufficient disinfection concentration and contact time, through disinfection with chlorine, chlorine dioxide, ozone, or through anodic oxidation. Disinfectant concentration and contact time (CT) can be based on existing CT tables (USEPA, 1991) or State-approved alternatives.



# Removal

- 💧 Removal with membrane technologies with an absolute molecular weight cut-off (MWCO), or an alternate parameter that describes the exclusion characteristics of the membrane, that can reliably achieve at least a 4-log removal of viruses.

# Alternative Treatment Technologies

- 💧 Inactivation, removal or combination of inactivation and removal through alternative treatment technologies approved by the State, if the alternative treatment technology, alone or in combination (*e.g.*, UV with filtration, chlorination with filtration), can reliably provide at least 4-log treatment of viruses.

## What about UV?

- 💧 UV not currently supported as a standalone treatment in GWR
- 💧 Lengthy explanation available (adenoviruses, dosages, evaluation of performance) – refer to Fed. Register
- 💧 May be part of the treatment process
- 💧 State does have the option of approving it as standalone treatment anyway

# Compliance monitoring

- 💧 For systems that provide 4-log removal treatment, routine compliance monitoring must be performed to ensure that the treatment is effective and public health is protected.

## Compliance monitoring – Chemical Disinfection

- 💧 Must meet and maintain State determined residual disinfectant concentration (4-log, based on CT tables)
- 💧 >3,300 – Continuous monitoring (§141.74(a)(2)) at state specified location and record lowest daily residual
- 💧 <3,300 - ↑, OR daily grab sample during peak flow time or State specified alternative

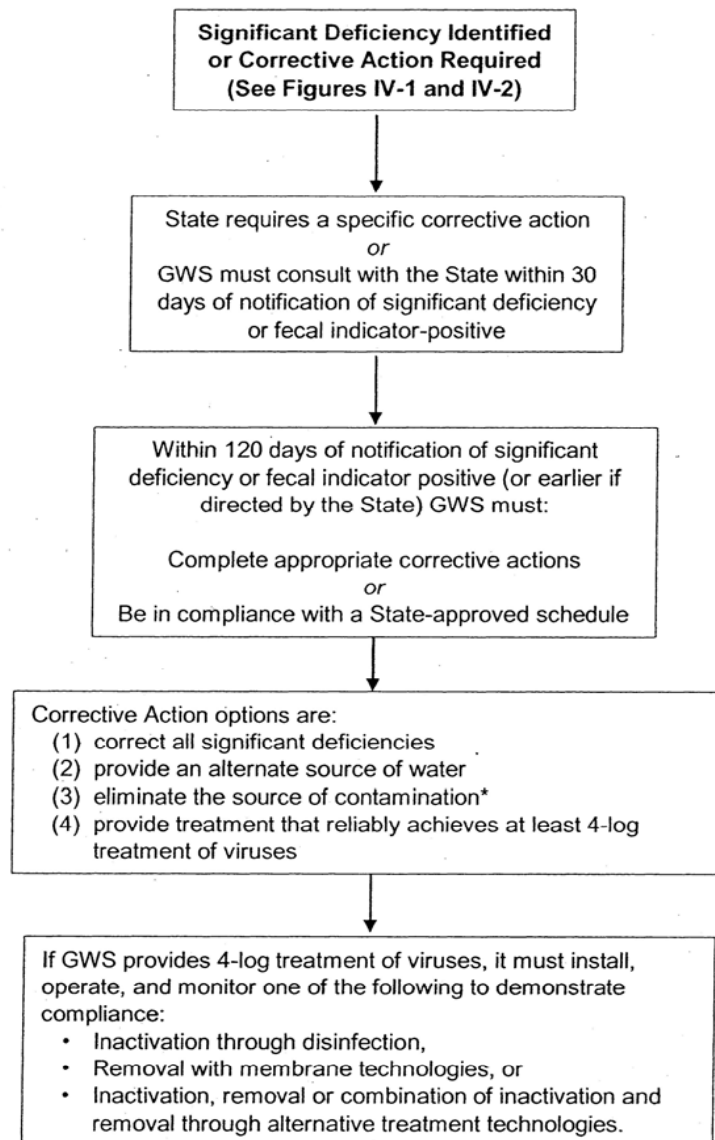
## Compliance monitoring – Chemical Disinfection

- 💧 If monitoring determines disinfectant residual level is not met, system has four hours to restore the level or it is a treatment technique violation.

# Compliance monitoring

- 💧 For membrane treatment, the system must ensure that the membrane is intact and that it meets state-specified compliance requirements.

Figure IV-3: Corrective Action Treatment Technique Requirements



\* If the State and GWS cannot determine the cause of the source water contamination, and the State determines based on follow-up monitoring or other evidence that the contamination is unlikely to occur again, the State may determine that the source of contamination has been eliminated.



# Public Notification Requirements

- 💧 Source sample positive for fecal indicator\* - **TIER 1 Notice required**
- 💧 System fails to comply with mandated corrective action or fails to maintain 4-log treatment – **TIER 2 Notice required**
- 💧 System fails to collect source water monitoring samples – **TIER 3 Notice required**
- 💧 Plus, special GWR PN requirements....

\* If not invalidated

# Public Notification Requirements

- 💧 System must provide PN if it has an uncorrected significant deficiency (or corrected significant deficiency if directed by the State) or a source water fecal indicator-positive sample. System must repeat notice annually until significant deficiency corrected or fecal contamination addressed.

# Public Notification Requirements

TABLE IV-4.—SUMMARY OF GWR PUBLIC NOTIFICATION REQUIREMENTS

Systems must comply with the following notification requirements when . . .	Reference
<b>Tier 1 Public Notification</b>	
Triggered source water monitoring sample or assessment source water monitoring sample is positive for <i>E. coli</i> , enterococci, or coliphage (and is not invalidated).	§ 141.402(g).
<b>Tier 2 Public Notification</b>	
A system fails to take corrective action following: <ul style="list-style-type: none"> <li>■ State direction to take corrective action for a fecal indicator-positive sample,</li> <li>■ Receipt of laboratory notice of fecal indicator-positive ground water source sample as a result of triggered source water monitoring under § 141.402(a)(3), or</li> <li>■ Receipt of State written notice of significant deficiency.</li> </ul>	§ 141.404(d).
A system fails to comply with a State-approved schedule and plan (including interim measures) related to correcting a significant deficiency and/or eliminating fecal contamination in a ground water source.	§ 141.404(d).
A system that elects to provide such treatment in lieu of triggered source water monitoring fails to maintain 4-log treatment of viruses [NOTE: There is no violation and public notification required if the system restores 4-log treatment within four hours.].	§ 141.404(d).
<b>Tier 3 Public Notification</b>	
A system fails to conduct triggered source water monitoring or assessment source water monitoring.	§ 141.403(d).
A system fails to conduct monitoring to demonstrate compliance with 4-log treatment requirement.	§ 141.403(d).

# Public Notice

TABLE IV-4.—SUMMARY OF GWR PUBLIC NOTIFICATION REQUIREMENTS—Continued

Systems must comply with the following notification requirements when . . .	Reference
<b>Special Notification Requirements</b>	
<p>CWSs: System has an uncorrected significant deficiency (or corrected significant deficiency if directed by the State) or a source water fecal indicator-positive sample. System must repeat notice annually until significant deficiency corrected or fecal contamination addressed in accordance with § 141.403(1).</p> <ul style="list-style-type: none"> <li>■ Provide notice as part of CCR.</li> <li>■ If significant deficiency is corrected before the next CCR, notification is not required unless directed by the State.</li> </ul> <p>NCWSs: System has an uncorrected significant deficiency (or corrected significant deficiency if directed by the State). System must repeat notice annually until significant deficiency corrected.</p> <ul style="list-style-type: none"> <li>■ Provide notice in manner approved by the State for significant deficiencies (e.g., posting in conspicuous places in service area or direct distribution of information to public served).</li> <li>■ If significant deficiency is corrected within 12 months, notification is not required unless directed by the State.</li> </ul>	<p>Notice must include:</p> <ul style="list-style-type: none"> <li>—nature of significant deficiency or ground water fecal contamination, and date.</li> <li>—if the fecal contamination has been addressed under § 141.403(a), and date.</li> <li>—State-approved plan and schedule, including interim measures completed (if process ongoing).</li> <li>—required fecal indicator-positive language at: <ul style="list-style-type: none"> <li>—§ 141.403(a)(7)(i).</li> </ul> </li> </ul> <p>Notice must include:</p> <ul style="list-style-type: none"> <li>—nature of significant deficiency and date.</li> <li>—State-approved plan and schedule, including interim measures completed (if process ongoing).</li> <li>—§ 141.403(a)(7)(ii).</li> </ul>

# Consecutive Systems

- ◆ Consecutive systems must comply with triggered source water monitoring requirements. A consecutive GWS that has a total coliform-positive TCR sample must notify the wholesale system(s) within 24 hours of being notified of the TC+ sample. If a wholesale GWS receives notice from a consecutive system it serves that a TCR sample is TC+, the wholesale GWS must conduct triggered source water monitoring. If the sample is fecal indicator-positive, in addition to notifying its own customers, the wholesale GWS must notify all consecutive systems served by that ground water source. The consecutive system is responsible for providing any required public notice to the persons it serves.

# Implementation Timeline

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
	Final GWR publication date (2006); final rule takes effect 3 years after published in Federal Register										
<b>State</b>	Implementation										
	Primacy Application		Possible Extension for Primacy								
				Conduct Sanitary Surveys							
				Review Triggered Source Water Monitoring							
				Review & Approve Corrective Action Review Compliance Monitoring							
<b>CWSs</b>	Implementation										
				1 <sup>st</sup> round Sanitary Surveys			2 <sup>nd</sup> round Sanitary Surveys			3 <sup>rd</sup> round Sanitary Surveys	
				Triggered Source Water Monitoring							
				Perform Corrective Action							
				Perform Compliance Monitoring							
<b>NCWSs</b>	Implementation										
				1 <sup>st</sup> round Sanitary Surveys				2 <sup>nd</sup> round Sanitary Surveys			
				Triggered Source Water Monitoring							
				Perform Corrective Action Perform Compliance Monitoring							

## Not Covered Here

- 🔹 Reporting/Recordkeeping
- 🔹 Variances/Exceptions
- 🔹 Cost/Benefit Analysis
- 🔹 Chronology/Development/Background of GWR
- 🔹 Invalidation of samples
- 🔹 How GWR affects other rules (TCR, PN, CCR, Labs)