Groundwater Rule

Reduce public health risk associated with fecal contamination for people served by groundwater sources.
Signed by EPA-
October 11, 2006

Compliance Date-
December 1, 2009

October 18, 2010
Major Provisions

- Sanitary surveys
- Source water monitoring
- Corrective actions
- Compliance monitoring
Sanitary Surveys

- Every 3 years for CWS/5 years for NCWS
- Eight key elements
- State must have authority to enforce corrections of “significant deficiencies”
Elements of Surveys

- Source (Protection, Physical Components and Condition)
- Treatment
- Distribution System
- Finished Water Storage
- Pumps Facilities and Controls
- Monitoring/Reporting/Data Verification
- Water System Management/Operations
- Operator Compliance with State Requirements
Source Water Monitoring

- Systems w/ wells in sensitive aquifer (Assessment monitoring)
- Contamination in distribution systems (Triggered monitoring)
Fecal Indicator

Testing for E. coli
Labs are set up and certified for it—Methods, Equipment, etc.

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Assessment Monitoring

- State MAY direct system to sample source(s)
- 12 monthly samples for fecal indicator
- PN for + samples
- Correction
South Dakota

- 303 sources* < 100’
- 113 of these go thru plants that “probably” have 4 log inactivation
- 190 sources may need “assessment monitoring”

*Wells, galleries, springs, etc

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Triggered Monitoring

- TCR “routine” sample that is TC+
- One sample per each GW source per unsafe TCR sample
- If you have many wells, you may want to submit sampling plan for representative wells
- Analyzed for E. coli
• ...so if a GW system that uses THREE wells submits THREE unsafe TCR samples in a month, it must submit NINE GWR triggered samples
• 3 wells X 3 unsafe TCR = 9 GWR samples
• Applies to mother system/daughter system situation also
• If original TC+ sample was from a consecutive system, “mother” system must collect the source samples

• If any “triggered” sample is positive
  • Either corrective action OR
  • Five additional GW “repeat” samples
  • If any “repeat” samples positive—Corrective action
• Tier 1 PN for any + source samples
• In addition, if “mother” system’s source sample is FC+
  • All consecutive systems served must be notified
*If TCR + sample is at a “daughter” system, the triggered sample(s) must be taken by “mother” system.
Corrective Actions

• If system has “significant deficiency” on survey or fecal indicator +, it must-
  • Consult w/ state w/in 30 days
  • Correct problem or have plan/schedule w/in 120 days
Options for Corrective Action

- Correct all deficiencies
- Alternate water source
- Eliminate source of contamination
- Treatment-4 log virus removal/inactivation/combo
What is “log” inactivation?

• If you inactivate 90% of something that is 1 log inactivation

• If you inactivate 90% of what is left, that is another log of inactivation-Total 2 log (Note-90% + 9% = 99% inactivation)

• Another 90% - Total 3 log (90% + 9% + 0.9% = 99.9%)
# Example-1000 People

<table>
<thead>
<tr>
<th></th>
<th>Started w/</th>
<th>Inactivate</th>
<th># Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Log</td>
<td>1000</td>
<td>900</td>
<td>100</td>
</tr>
<tr>
<td>2 Log</td>
<td>100</td>
<td>90</td>
<td>10</td>
</tr>
<tr>
<td>3 Log</td>
<td>10</td>
<td>9</td>
<td>1</td>
</tr>
</tbody>
</table>

So starting w/ 1000 people, a 3 log (or 99.9%) inactivation leaves you w/ 1 person left.

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...so to meet the GWR, you will need enough disinfectant and/or detention time to inactivate 99.99% of viruses

This would be a 4 log inactivation OR
• Membrane filtration (Removal)
• Combination of removal & inactivation
• Other State approved method
Very Important Point! (VIP)

Just because you are chlorinating, this does not mean you are already in compliance with the GWR. You must have enough CT to meet the 4-log inactivation.

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<table>
<thead>
<tr>
<th>Temp</th>
<th>Free Cl₂- pH 6-9</th>
<th>Free Cl₂- pH 10</th>
<th>ClO₂- pH 6-9</th>
<th>Chloramines</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>12</td>
<td>90</td>
<td>50.1</td>
<td>2883</td>
</tr>
<tr>
<td>5</td>
<td>8</td>
<td>60</td>
<td>33.4</td>
<td>1988</td>
</tr>
<tr>
<td>10</td>
<td>6</td>
<td>45</td>
<td>25.1</td>
<td>1491</td>
</tr>
<tr>
<td>15</td>
<td>4</td>
<td>30</td>
<td>16.7</td>
<td>994</td>
</tr>
<tr>
<td>20</td>
<td>3</td>
<td>22</td>
<td>12.5</td>
<td>746</td>
</tr>
<tr>
<td>25</td>
<td>2</td>
<td>15</td>
<td>8.4</td>
<td>497</td>
</tr>
</tbody>
</table>

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Water System

Well → Clearwell → 1st Customer

Cl₂ Application Point

Cl₂ Measurement Point

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<table>
<thead>
<tr>
<th>Baffling Level</th>
<th>Factor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unbaffled</td>
<td>0.1</td>
<td>None</td>
</tr>
<tr>
<td>Poor</td>
<td>0.3</td>
<td>Single or multiple unbaffled in/outlets...</td>
</tr>
<tr>
<td>Average</td>
<td>0.5</td>
<td>Baffled inlet or outlet, some intra-basin...</td>
</tr>
<tr>
<td>Superior</td>
<td>0.7</td>
<td>Serpentine or perforated intra-basin baffles...</td>
</tr>
<tr>
<td>Perfect</td>
<td>1.0</td>
<td>Similar to pipe flow</td>
</tr>
</tbody>
</table>

*Multiply baffling factor by theoretical DT*
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CT Calculation

- Using Free Cl₂
- Temp 10° C and pH 7.5
- DT from pt of application to pt where Cl₂ is measured is 3 minutes at highest flow
- From previous table, required CT = 6
- Free Cl₂ level must be at least 2 mg/l

6 CT / 3 minutes = 2 mg/l

- If DT was only 1 minute then Cl₂ would have to be 6 mg/l
Detention Time versus Chlorine Level
If anyone wants to show they have a 4 log inactivation, there is a spreadsheet available; however, ...
Options

- If you have only a couple wells & very few TCR+, it might be OK to take source samples after TCR+.
- If you have a lot of wells, it might be worthwhile to show 4 log and avoid triggered monitoring.
Compliance Monitoring

- 3300 or more people - Continuously monitor residual
- < 3300 people - Daily grab sample for residual
- Provisions for other types of treatment
Summary

• December 1, 2009
• Triggered Sampling
• Show 4-log inactivation
• “Significant deficiencies” must be fixed
EPA web site for Groundwater Rule

www.epa.gov/ogwdw/gwr.html

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May I Answer Any Questions?

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