



Ground Water Rule

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Drinking Water Program



October 18, 2010

Groundwater Rule

*Reduce public health
risk associated with
fecal contamination
for people served by
groundwater sources*



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*Signed by EPA-
October 11, 2006*

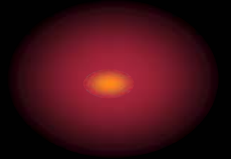
*Compliance Date-
December 1, 2009*



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Major Provisions

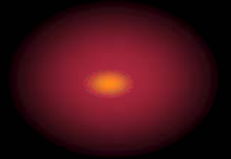
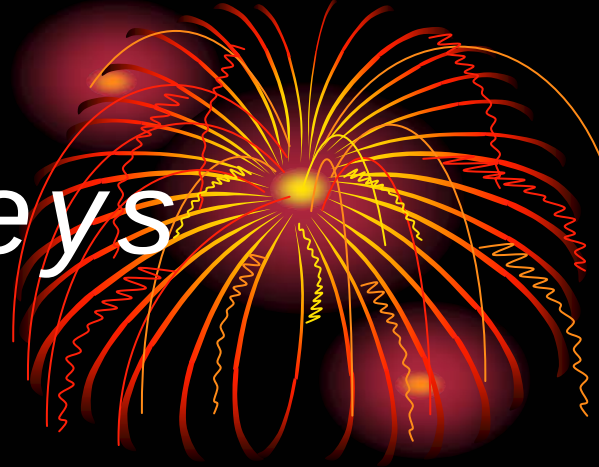
- *Sanitary surveys*
- *Source water monitoring*
- *Corrective actions*
- *Compliance monitoring*



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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

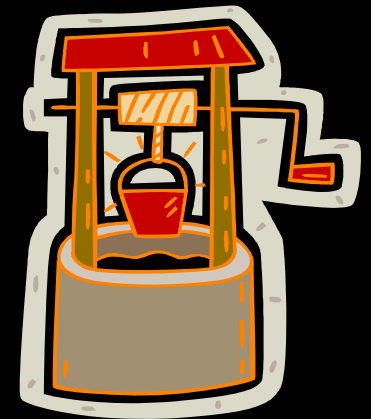


- *Source (Protection, Physical Components and Condition)*
- *Treatment*
- *Distribution System*
- *Finished Water Storage*
- *Pumps Facilities and Controls*
- *Monitoring/Reporting/Data Verification*
- *Water System Management/Operations*
- *Operator Compliance with State Requirements*

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Source Water Monitoring

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

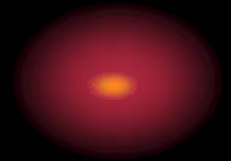


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Fecal Indicator

Testing for E. coli

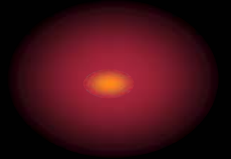
*Labs are set up and
certified for it—
Methods, Equipment,
etc.*



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Assessment Monitoring

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

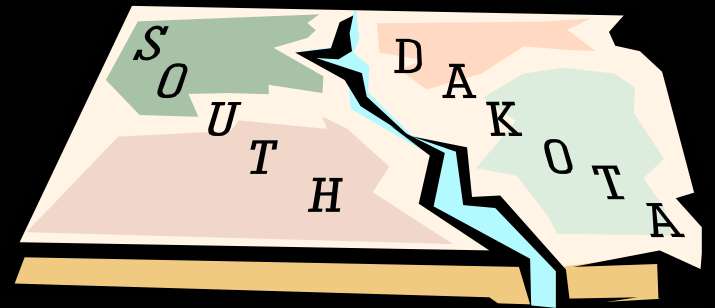


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South Dakota

- 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*



Triggered Monitoring



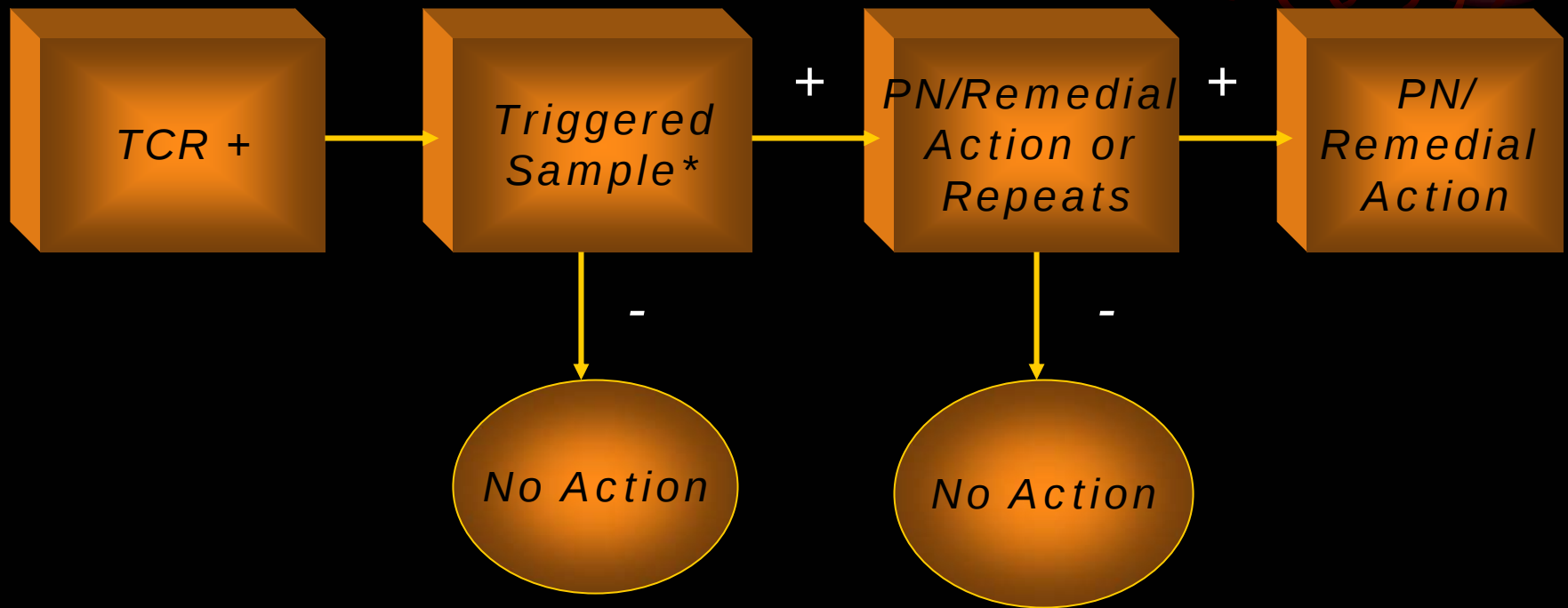
- *TCR “routine” sample that is TC+*
- *One sample per each GW source per unsafe TCR sample*
- *If you have many wells, you may want to submit sampling plan for representative wells*
- *Analyzed for E. coli*

- 
- ...so if a GW system that uses **THREE** wells submits **THREE** unsafe TCR samples in a month, it must submit **NINE** GWR triggered samples
 - $3 \text{ wells} \times 3 \text{ unsafe TCR} = 9 \text{ GWR samples}$
 - 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.*

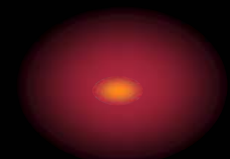
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Corrective Actions



- *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

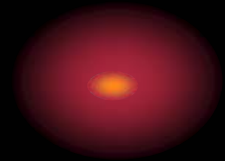


- *Correct all deficiencies*
- *Alternate water source*
- *Eliminate source of contamination*
- *Treatment-4 log virus removal/
inactivation/combo*



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



	<i>Started w/</i>	<i>Inactivate</i>	<i># Left</i>
<i>1 Log</i>	<i>1000</i>	<i>900</i>	<i>100</i>
<i>2 Log</i>	<i>100</i>	<i>90</i>	<i>10</i>
<i>3 Log</i>	<i>10</i>	<i>9</i>	<i>1</i>

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

*...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*

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- *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.*



CT Values

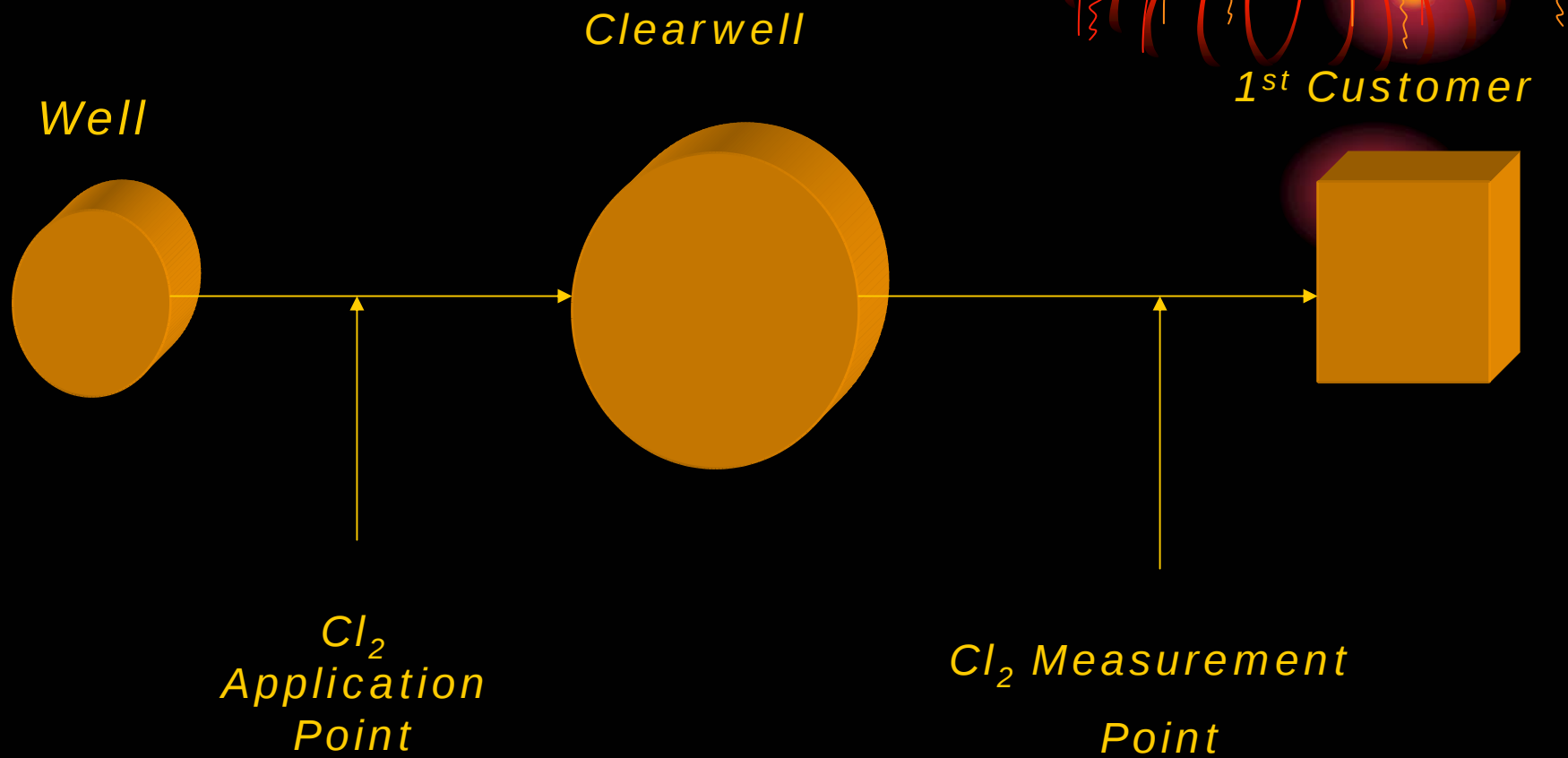
4 Log Virus Removal



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

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Water System



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Baffling Factors*



<i>Unbaffled</i>	<i>0.1</i>	<i>None</i>
<i>Poor</i>	<i>0.3</i>	<i>Single or multiple unbaffled in/outlets...</i>
<i>Average</i>	<i>0.5</i>	<i>Baffled inlet or outlet, some intra-basin...</i>
<i>Superior</i>	<i>0.7</i>	<i>Serpentine or perforated intra-basin baffles...</i>
<i>Perfect</i>	<i>1.0</i>	<i>Similar to pipe flow</i>

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**Multiply baffling factor by theoretical DT*

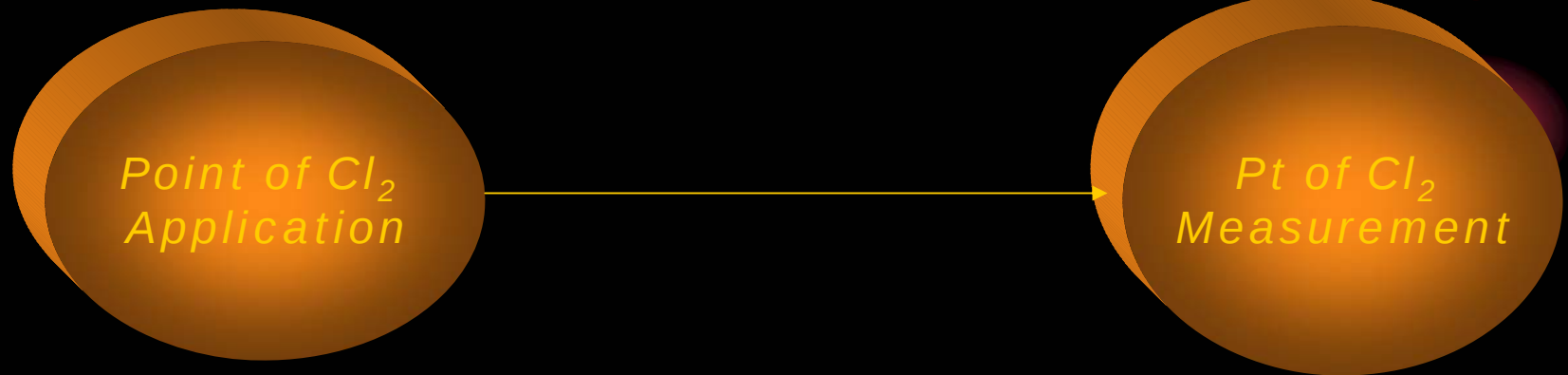
CT Calculation

- *Using Free Cl_2*
- *Temp 10°C and pH 7.5*
- *DT from pt of application to pt where Cl_2 is measured is 3 minutes at highest flow*
- *From previous table, required CT = 6*
- *Free Cl_2 level must be at least 2 mg/l*

$$6 \text{ CT} / 3 \text{ minutes} = 2 \text{ mg/l}$$

- *If DT was only 1 minute then Cl_2 would have to be 6 mg/l*





*Detention Time versus
Chlorine Level*

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*If anyone wants to show
they have a 4 log
inactivation, there is a
spreadsheet available;
however, ...*

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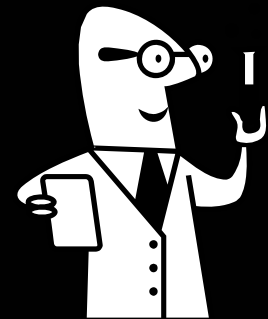
Options



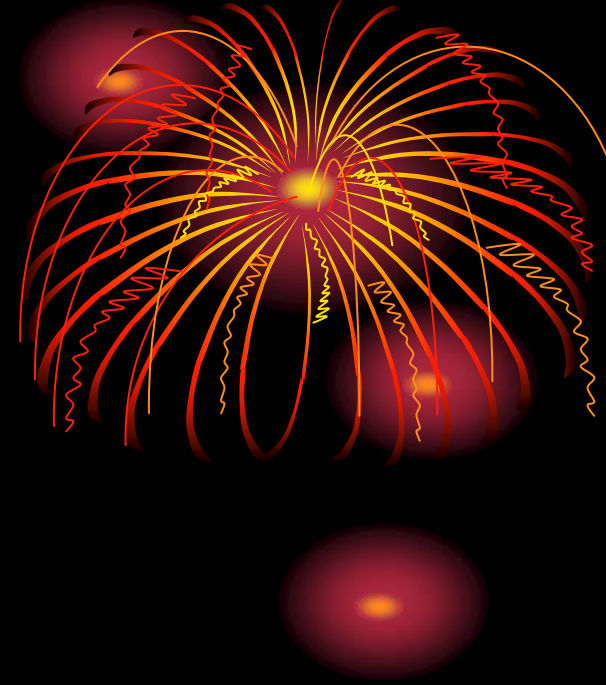
- *If you have only a couple wells & very few TCR+, it might be OK to take source samples after TCR+.*
- *If you have a lot of wells, it might be worthwhile to show 4 log and avoid triggered monitoring.*

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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