

# CT Studies for Ground Water Plants

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# GWDR CT Study Template

- A one-page form used to evaluate the disinfection protocol at plants treating Ground Water (NOT under the direct influence of surface water)
- Available in MS Excel, MS Word, and Adobe pdf
- Applicable at most plants that:
  - utilize free chlorine for disinfection, and
  - use storage tanks that have (both) inlets and outlets.



# GWDR CT Study Template (cont)

## Entry Point Analysis Worksheet for Groundwater Systems That Use Free Chlorine and Desire a Minimum Specified Residual

1	Total capacity (maximum) of all storage tanks at this site				gallons
2	Minimum volume/water level				gallons (or feet)
3	Maximum volume/water level				gallons (or feet)
4	Actual Min/Max Ratio (line 2 divided by line 3)				
5	Maximum allowable ratio		0.50		
6	Allowable ratio (minimum of line 4 and line 5)				
7	Allowable Volume (line 1 times line 6)				gallons
8	Baffling Factor			0.1	
9	Effective Volume (line 7 times line 8)				gallons
10	Total capacity (maximum) of the wells feeding these tanks				gpm
11	Total capacity (maximum) of all the service pumps fed by these tanks				gpm
12	Flow rate (minimum of line 10 and line 11)				gpm
13	T <sub>10</sub> for this site (line 9 divided by line 12)				minutes
14	CT required for a 4-log viral inactivation if the water temperature is at least 10°C and the pH is not greater than 9.5.				6.0 mg/L-min
<p><b>Assuming that you are using free chlorine, your water temperature does not drop below 10°C (60°F), and the pH is always below 9.5 . . . The Minimum Specified Residual for this Entry Point will be:</b></p> <p>(line 14 divided by line 13)</p>					<b>mg/L</b>

If the T<sub>10</sub> is less than 1.5 minutes, the TCEQ cannot approve a Minimum Specified Residual for this site because it would be greater than 4.0 mg/L under worst-case operating conditions.



# GWDR CT Study Template (cont)

1	Total capacity (maximum) of all storage tanks at this site		gallons
2	Minimum volume/water level		gallons (or feet)
3	Maximum volume/water level		gallons (or feet)
4	Actual Min/Max Ratio (line 2 divided by line 3)		
5	Maximum allowable ratio	0.50	
6	Allowable ratio (minimum of line 4 and line 5)		
7	Allowable Volume (line 1 times line 6)		gallons
8	Baffling Factor	0.1	
9	Effective Volume (line 7 times line 8)		gallons

- Yellow Area/Cell: A place where you must enter data
- (Burnt) Orange Area/Cell: A calculated value



# GWDR CT Study Template (cont)

1	Total capacity (maximum) of all storage tanks at this site		<b>78,750</b> gallons
2	Minimum volume/water level	<b>12.0</b>	gallons (or feet)
3	Maximum volume/water level	<b>22.5</b>	gallons (or feet)
4	Actual Min/Max Ratio (line 2 divided by line 3)	<b>0.56</b>	
5	Maximum allowable ratio	0.50	
6	Allowable ratio (minimum of line 4 and line 5)	<b>0.50</b>	
7	Allowable Volume (line 1 times line 6)		<b>39,375</b> gallons
8	Baffling Factor		0.1
9	Effective Volume (line 7 times line 8)		<b>3,938</b> gallons



# GWDR CT Study Template (cont)

9	Effective Volume (line 7 times line 8)		gallons
10	Total capacity (maximum) of the wells feeding these tanks	gpm	
11	Total capacity (maximum) of all the service pumps fed by these tanks	gpm	
12	Flow rate (minimum of line 10 and line 11)		gpm
13	$T_{10}$ for this site (line 9 divided by line 12)		minutes
14	CT required for a 4-log viral inactivation if the water temperature is at least 10°C and the pH is not greater than 9.5.		6.0 mg/L-min
<p><b>Assuming that you are using free chlorine, your water temperature does not drop below 10°C (60°F), and the pH is always below 9.5 . . . The Minimum Specified Residual for this Entry Point will be:</b></p> <p>(line 14 divided by line 13)</p>			<b>mg/L</b>



# GWDR CT Study Template (cont)

9	Effective Volume (line 7 times line 8)		<b>3,938</b>	gallons
10	Total capacity (maximum) of the wells feeding these tanks	<b>240</b>		gpm
11	Total capacity (maximum) of all the service pumps fed by these tanks	<b>800</b>		gpm
12	Flow rate (minimum of line 10 and line 11)		<b>240</b>	gpm
13	T <sub>10</sub> for this site (line 9 divided by line 12)		<b>16.4</b>	minutes
14	CT required for a 4-log viral inactivation if the water temperature is at least 10°C and the pH is not greater than 9.5.			6.0 mg/L-min
<p>Assuming that you are using free chlorine, your water temperature does not drop below 10°C (60°F), and the pH is always below 9.5 . . . The Minimum Specified Residual for this Entry Point will be:</p> <p>(line 14 divided by line 13)</p>				<b>0.4 mg/L</b>



# Surface Water CT Study Template

- An Excel 2003 spreadsheet that is used to evaluate the disinfection protocol at plants treating Surface Water or Groundwater under the Direct Influence of Surface Water.
- Ground Water plants can use this spreadsheet to claim credit for:
  - Contact time in pipelines
  - Tanks with internal baffles
  - Tanks in series



# Submitting a CT Study

- Any PWS representative can submit the CT Study
  - Consulting engineer
  - Utility Director
  - Plant Operator
  - even the Mayor
- Send it to:
  - TCEQ/PDWS/DWPT (MC-155)
  - P.O. Box 13087
  - Austin, Texas 78711-3087
  - Attn: Groundwater CT Study



# Thank You

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