



# Fact Sheet: Disinfection Profiling and Benchmarking for LT1ESWTR

The Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) was finalized January 14, 2002. LT1ESWTR requires public water systems that use surface water or ground water under the direct influence of surface water and serve fewer than 10,000 people to evaluate their disinfection practices through disinfection profiling and benchmarking.

## WHAT IS A DISINFECTION PROFILE?

A disinfection profile summarizes the effectiveness of your system's disinfection practices. Figure 1 is a graphical representation of a system's level of inactivation (i.e., pathogens killed by disinfection) of *Giardia lamblia* (and viruses if your system uses chloramines, ozone or chlorine dioxide for primary disinfection) each week for a period of one year. The disinfection profile does not need to be submitted to the State. However, it must be available for review during a sanitary survey.

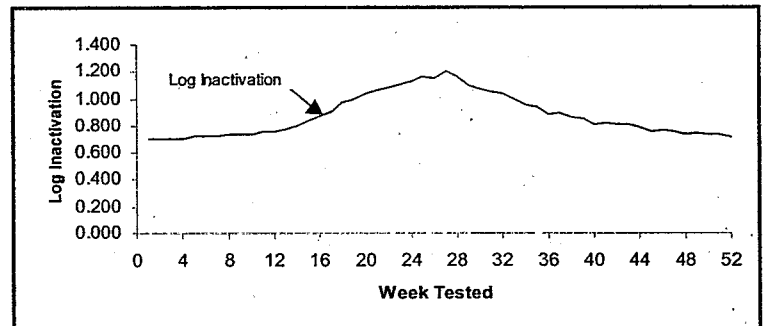


Figure 1 - Example Disinfection Profile

Systems serving 500 to 9,999 people have to begin their disinfection profile by July 1, 2003. Systems serving fewer than 500 people must start their profile by January 1, 2004. **Systems are reminded that the State may waive the profile requirement if a system can satisfy certain TTHM and HAA5 criteria.**

## HOW IS A DISINFECTION PROFILE DEVELOPED?

To develop a disinfection profile, a system should start by identifying disinfection segments. A disinfection segment is a section of a treatment system beginning at one disinfectant injection or monitoring point and ending at the next disinfectant injection or monitoring point. The final disinfectant monitoring point must be located before or at the first customer.

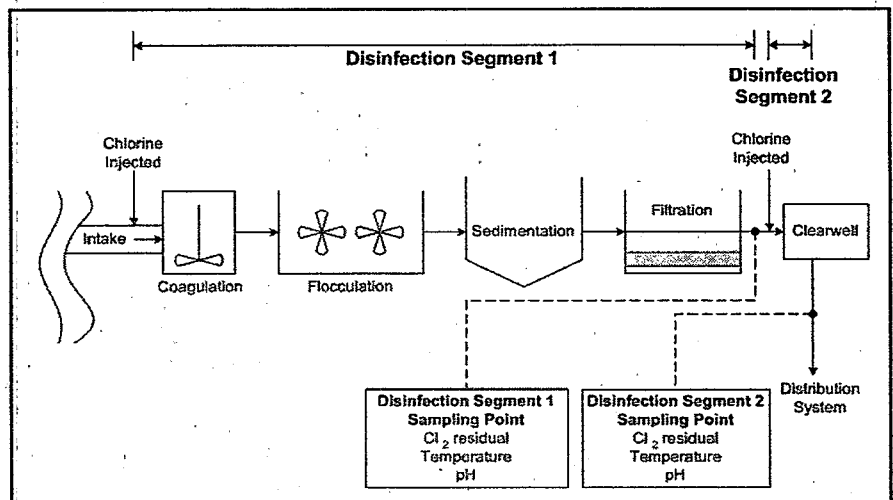


Figure 2 - A System with Two Disinfection Segments

day each week, over the course of one year, during peak hourly flow, to determine log inactivation for the treatment plant:

- The residual disinfectant concentration ("C", in mg/L);
- Contact time "T" in minutes (the time the water is in contact with the disinfectant); **AND**
- At each residual disinfectant concentration sampling point:
  - Water temperature (in degrees Celsius) and
  - pH (only for systems using chlorine).

during peak hourly flow from all disinfection segments using analytical methods specified in 40 CFR Part § 141.74(a).

An electronic spreadsheet to assist systems in calculating log inactivation values and the disinfection profile and benchmark is posted on the EPA website [<http://www.epa.gov/safewater/mdbp/lt1eswtr.html>].

The contact time T (sometimes referred to as  $T_{10}$ ) is an estimate of the detention time within a basin, pipe or other sub-unit (such as a clearwell).

**HINT:** Before measuring or calculating T, the system should review its own permits and/or other documents, or contact the State to see if T has already been determined (e.g., historical records or a tracer study). If T is already known, Steps 3 through 7 in the table below (used to calculate T) can be skipped.

The following 12-step approach may be used to calculate log inactivation for the treatment plant.

### 12 Suggested Steps to Calculating Weekly *Giardia*\* Log Inactivation

Step	Action/Activity/Task	Step	Action/Activity/Task
1	Determine the peak hourly flow in gallons/minute.	7	Calculate the contact time of the disinfectant in the sub-unit (Contact Time "T" = TDT x BF).
2	Measure the residual disinfectant concentration ("C", in mg/L), temperature (in °C), and pH (if chlorine is used) during peak hourly flow at the same sampling point and time.	8	Determine $CT_{calc}$ . Where $CT_{calc} = C \times T$ [C is residual disinfectant concentration, measured in Step 2 (in mg/L), and T is contact time, calculated in Step 7 (in minutes)].
3	Measure the physical dimensions of the sub-unit (e.g., clearwell or pipe) <ul style="list-style-type: none"> <li>• Measure the inner diameter, which will be used to determine the volume of water in the sub-unit.</li> <li>• Measure the minimum operating depth in the sub-unit to obtain a conservative estimate of water depth in the sub-unit.</li> </ul>	9	Locate CT table for 3-log <i>Giardia</i> inactivation based on water temperature, pH, and residual disinfectant concentration. See Appendix B in the LT1ESWTR Disinfection Profiling and Benchmarking Technical Guidance Manual for the CT tables.
4	Calculate the volume of the water (in $ft^3$ ) in the sub-unit based on measurements in Step 3. <ul style="list-style-type: none"> <li>• See Appendix F in the LT1ESWTR Disinfection Profiling and Benchmarking Technical Guidance Manual for volume equations.</li> </ul>	10	Obtain $CT_{99.9}$ value(s) from the table in Step 9.
5	Calculate the Theoretical Detention Time (TDT) <ul style="list-style-type: none"> <li>• <math>TDT = V / Q</math>. Where V = volume and Q = peak hourly flow. Remember to work in common units (7.48 gallons = 1 cubic foot).</li> </ul>	11	Where applicable, repeat steps 1 through 11 for each disinfection segment.
6	Determine the baffling factor (BF) for the sub-unit [see the LT1ESWTR Disinfection Profiling and Benchmarking Technical Guidance Manual (Chapter 3 and Table 3-2) for information on baffling factors or check with your State].	12	For systems with one disinfection segment calculate log inactivation = $3 \times CT_{calc} / CT_{99.9}$ . For systems with two or more disinfection segments, calculate log inactivation = $3 \times \sum CT_{calc} / CT_{99.9}$ where $\sum CT_{calc} / CT_{99.9}$ = the sum of the inactivation ratios for all disinfection segments.

\*Systems using chloramines, ozone, or chlorine dioxide, as the primary disinfectant must also calculate virus log inactivation. For more information on calculating virus log inactivation see the LT1ESWTR Disinfection Profiling and Benchmarking Technical Guidance Manual.

## WHAT IS THE NEXT STEP?

To complete the disinfection profile, the data must be retained in a graphic form. Figure 3 is one example of how to plot weekly log inactivation values. Disinfection profile data are calculated over the course of one year. The log inactivations are plotted along the vertical axis corresponding to the weeks of the year plotted along the horizontal axis. After the points are plotted, lines are drawn to connect the points in order by the week tested.

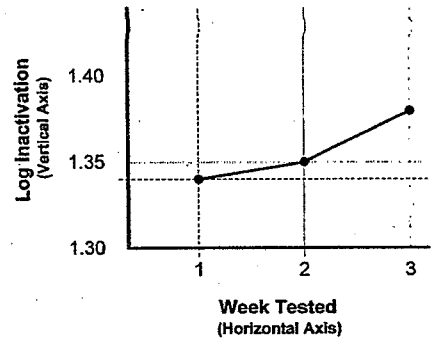


FIGURE 3 - GRAPHIC OF WEEKLY DATA

## WHAT IS A DISINFECTION BENCHMARK?

A disinfection benchmark must be determined by your system if:

- You had to develop a disinfection profile **AND**
- You are considering making a significant change to your disinfection practices.

Your system must complete the disinfection profile and benchmark and consult with the State before making a significant change to your disinfection practices.

The disinfection benchmark is a water system's lowest monthly average log inactivation, and is determined using the data collected weekly for the disinfection profile. To determine the benchmark, the system must first calculate the average log inactivation for each calendar month of the disinfection profile. The monthly average log inactivation is calculated by adding the weekly log inactivation values for a particular month and dividing that value by the number of weekly values for that particular month. The month with the lowest monthly average log inactivation is the benchmark.

## WHAT MUST A SYSTEM DO IF CONSIDERING A SIGNIFICANT CHANGE TO DISINFECTION PRACTICES?

Significant changes include: (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.

If you are considering a significant change to disinfection practices your system must consult with the State for approval and submit the following information to the State:

- A description of the proposed change;
- The disinfection profile and benchmark;
- An analysis of how the proposed change will affect the current levels of disinfection; and
- Any additional information requested by the State.

## WHERE CAN I GET MORE INFORMATION ON DISINFECTION PROFILING AND BENCHMARKING?

- **LT1ESWTR Disinfection Profiling and Benchmarking Technical Guidance Manual [EPA 816-R-03-004]**— This manual will provide information on the disinfection profiling and benchmarking process. Detailed explanations and examples will be presented to assist system operators with performing the disinfection profiling and benchmarking analyses (anticipated publication date is June 2003).

For general information or to obtain the document listed above, contact the Safe Drinking Water Hotline at 1-800-426-4791 or visit <http://www.epa.gov/safewater/mdbp/lt1eswtr.html>

# PLEASE LOOK INSIDE

**Your water system might be affected by the requirements of the new Long Term 1 Enhanced Surface Water Treatment Rule.**

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Office of Water (4606M)

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[www.epa.gov/safewater](http://www.epa.gov/safewater)

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