

should the significant excursion be based on the standard deviation of the LRAA exceeding specific numerical values for either TTHM (e.g., 0.020 mg/l) or HAA5 (e.g., 0.015 mg/L)? Or should the excursion be based on a relative measure of variability (e.g., a relative standard deviation exceeding 25% or 50%) with the condition of a threshold average concentration also being exceeded (e.g., an LRAA needing to be at least 0.040 mg/l for TTHM or 0.030 mg/l for HAA5)? EPA requests comment on the above approaches or alternative approaches for determining whether a significant excursion has occurred. EPA also requests comment on whether different approaches may be appropriate for large and small systems.

#### F. BAT for TTHM and HAA5

##### 1. What Is EPA Proposing Today?

Today, EPA is proposing that the best available technology (BAT) for the TTHM and HAA5 LRAA MCLs (0.080 mg/L and 0.060 mg/L respectively) be one of the three following technologies:

(1) GAC adsorbers with at least 10 minutes of empty bed contact time and an annual average reactivation/replacement frequency no greater than 120 days, plus enhanced coagulation or enhanced softening.

(2) GAC adsorbers with at least 20 minutes of empty bed contact time and an annual average reactivation/replacement frequency no greater than 240 days.

(3) Nanofiltration (NF) using a membrane with a molecular weight cut off of 1000 Daltons or less (or demonstrated to reject at least 80% of the influent TOC concentration under typical operating conditions).

EPA is proposing a different BAT for consecutive systems than for wholesale systems to meet the TTHM and HAA5 LRAA MCLs. The proposed consecutive system BAT is chloramination with management of hydraulic flow and storage to minimize residence time in the distribution system.

##### 2. How Was This Proposal Developed?

a. *Basis for the BAT.* The Safe Drinking Water Act directs EPA to specify BAT for use in achieving compliance with the MCL. Systems unable to meet the MCL after application of BAT can get a variance (see section V.L. for a discussion of variances). Systems are not required to use BAT in order to comply with the MCL. They can use other technologies as long as they meet all drinking water standards and are approved by the State.

EPA examined BAT using two different methods: (1) EPA analyzed

data from the Information Collection Rule treatment studies and (2) EPA used the Surface Water Analytical Tool (SWAT), a model developed to compare alternative regulatory strategies. Both analyses support the BAT options proposed today. The results of each analyses are presented in the following two sections.

i. BAT analysis using the Information Collection Rule treatment studies. EPA analyzed data from the Information Collection Rule treatment studies (Information Collection Rule Treatment Study Database CD-ROM, Version 1.0, USEPA 2000m; Hooper and Allgeier 2002). The treatment studies were designed to evaluate the technical feasibility of using GAC and NF to remove DBP precursors prior to the addition of chlorine-based disinfectants. Systems were required to conduct an Information Collection Rule treatment study based on TOC levels in the source or finished water. Specifically, surface water plants with annual average source water TOC concentrations greater than 4 mg/L and ground water plants with annual average finished water TOC concentrations greater than 2 mg/L were required to conduct treatment studies. Thus, the plants required to conduct treatment studies generally had waters with organic DBP precursor levels that were significantly higher than the Information Collection Rule national plant medians of 2.7 mg/L for source water at surface water plants and 0.2 mg/L for finished water at ground water plants (USEPA 2003o).

Plants that conducted GAC studies typically evaluated performance at two empty bed contact times, 10 and 20 minutes, over a wide range of operational run times to evaluate the variable nature of TOC removal by GAC. This allowed GAC performance to be assessed with respect to empty bed contact time as well as reactivation/replacement frequency. Plants that conducted membrane treatment studies evaluated one or two nanofiltration membranes with molecular weight cutoffs less than 1000 Daltons. Regardless of the technology evaluated, all treatment studies evaluated DBP formation in the effluent from the advanced process under simulated distribution system conditions representative of the average residence time and using free chlorine as the primary and residual disinfectant. (For more information on the Information Collection Rule treatment study requirements and testing protocols, see USEPA 1996 a and b.)

Based on the treatment study results, GAC is effective for controlling DBP formation for waters with influent TOC

concentrations below approximately 6 mg/L (based on the Information Collection Rule and NRW data, over 90 percent of plants have average influent TOC levels below 6 mg/L (USEPA 2003o)). Of the plants that conducted an Information Collection Rule GAC treatment study, approximately 70% of the surface water plants studies could meet the 0.080 mg/L TTHM and 0.060 mg/L HAA5 MCLs, with a 20% safety factor (i.e., 0.064 mg/L and 0.048 mg/L, respectively) using GAC with 10 minutes of empty bed contact time and a 120 day reactivation frequency, and 78% of the plants could meet the MCLs with a 20% safety factor using GAC with 20 minutes of empty bed contact time and a 240 day reactivation frequency. As discussed previously, the treatment studies were conducted at plants with poorer water quality than the national average. Therefore, EPA believes that much higher percentages of plants nationwide could meet the MCLs with the proposed GAC BATs.

Among plants using GAC, larger systems would likely realize an economic benefit from on-site reactivation, which could allow them to use smaller, 10-minute empty bed contact time contactors with more frequent reactivation (i.e., 120 days or less). Most small systems would not find it economically advantageous to install on-site carbon reactivation facilities, and thus would opt for larger, 20-minute empty bed contact time contactors, with less frequent carbon replacement (i.e., 240 days or less).

The proposed reactivation/replacement interval for the 20 minute contactor (i.e., 240 days) is double the reactivation/replacement interval for 10 minute contactor (i.e., 120 days). This is based on the assumption of a linear relationship between empty bed contact time and the reactivation interval (e.g., a doubling of the empty bed contact time will result in a doubling of the reactivation interval). The data from the Information Collection Rule treatment studies indicates that this linear relationship may not always hold and that doubling the empty bed contact time generally results in more than a doubling of the reactivation interval. While there may be some operational advantage in using larger empty bed contact times, the larger contactors will result in additional capital expenditures. Furthermore, the economic optimization of a GAC process must also consider the number of smaller contactors in parallel, since it may be advantageous to operate a larger number of smaller contactors in parallel, allowing each individual contactor to be