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Jim Dahlquist  
Fishhawk Lake Rec. Club  
9997 Beach Drive  
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Tracer Study, Plan Review # 83-2011, Fishhawk Lake Rec. Club, PWS ID # 41 00124

Mr. Dahlquist:

I have received and reviewed the Disinfection Contact Time Tracer Study at Fishhawk Lake performed by HBH Consulting Engineers on February 7, 2011. The tracer study is not acceptable given the current conditions of the plant, unless modifications are made. The results of the tracer study for contact time at the water system are summarized below:

Flow leaving the 13,000 gallon clearwell: 67.7 gallons per minute (gpm)  
Volume at the beginning of the test: 8,616 gallons  
Volume at the end of the test: 7,090 gallons  
Minimum operating volume of the clearwell: 5,566 gallons  
Contact time: 62 minutes  
Baffling factor of clearwell determined from study: 48.6 %

I have the following comments regarding the test:

The tracer study was not performed simulating the lowest operating depth of the clearwell, of 5,566 gallons (an operating level of 31 inches). The contact time determined during the test, was achieved at a volume of 7,090 gallons, which is greater than 10 % over 5,566 gallons. The tracer study must be performed at a volume within 10 % of the lowest operating volume of the clearwell. You have the following two options:

1. Increase the lowest operating volume in the clearwell to at least 36 inches (6,462 gallons), such that the volume at the end of the test of 7,090 gallons, is no more than 10 % over the new minimum operating level. Use 62 minutes as the contact time for daily disinfection verification in the monthly operating forms that you submit to the Drinking Water Program. In order to meet the

required 1.0-log *giardia* inactivation requirement for disinfection at worst-case conditions, with this new contact time, it will be necessary to increase the minimum chlorine residual at the water plant to at least 1.0 milligrams per liter (mg/L). In February 2011, with a pH of 7.1 and a temperature of 3.3 degrees Celsius, a required CT (chlorine residual multiplied by contact time) of almost 60 was necessary.

2. If you do not increase the minimum operating level of the clearwell to at least 36 inches, you must use a value for contact time (40 minutes) calculated from the newly determined baffling factor of the clearwell determined above, 48.6%, and the current lowest operating volume, 5,566 gallons. It will then be necessary to increase the chlorine residual at the water plant to 1.5 mg/L to meet a required CT of 60 during worst-case (cold weather) water quality conditions. This is *only* to be used until the tracer study is conducted at a volume simulating the lowest operating volume of the clearwell, and a more accurate contact time is determined for existing operating conditions. The baffling factor of 48.6%, is calculated according to the following formula using parameters from the tracer study:

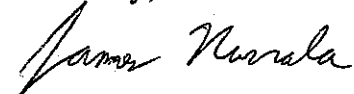
$$\text{Baffling Factor} = [\text{Peak flow (67.6 gpm)} \times \text{Contact time (62 min)}] / [\text{Largest Volume (8,616 gal)}]$$

Alternatively, if the volume in the clearwell is greater than the minimum operating level of 5,566 gallons, you may use the following formula to calculate the actual contact time occurring in determining the CT achieved at your system:

$$\text{Contact time} = [\text{Volume}_{\text{lowest level}} \times (0.486)] / [67.6 \text{ gpm}]$$

If you have any questions, or would like this letter in an alternate format, please contact me at either (971) 673-0459 or james.b.nusrala@state.or.us.

Sincerely,



James Nusrala, P.E.

Regional Engineer

<http://public.health.oregon.gov/HealthyEnvironments/DrinkingWater>

cc: Rob Henry, P.E., HBH Consulting Engineers