

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Water Supply and Wastewater Management

DOCUMENT NUMBER: 383-2129-002

TITLE: Guidance for Evaluating Alternate Recycle Return Locations Proposed under the Filter Backwash Recycling Rule

EFFECTIVE DATE: November 27, 2004

AUTHORITY: Pennsylvania's Safe Drinking Water Act (35 P.S. Section 721.1 *et seq.*) and regulations in Title 25 Pa. Code Chapter 109.

POLICY: Department of Environmental Protection (DEP) staff will follow the guidance and procedures presented in this document when evaluating requests to return recycle flows to a location other than the head of the plant for conventional and direct filtration facilities.

PURPOSE: The purpose of this document is to establish a rational and reasonable basis for staff decisions which will promote quality, timely and consistent service to the public and regulated community.

APPLICABILITY: This guidance applies to public water systems that utilize conventional or direct filtration and desire to recycle spent filter backwash, thickener supernatant or liquids from dewatering processes to a location other than the head of the plant.

DISCLAIMER: The policies and procedures outlined in this guidance are intended to supplement existing requirements. Nothing in the policies or procedures shall affect regulatory requirements.

The policies and procedures herein are not an adjudication or a regulation. There is no intent on the part of DEP to give the rules in these policies that weight or deference. This document establishes the framework within which DEP will exercise its administrative discretion in the future. DEP reserves the discretion to deviate from this policy statement if circumstances warrant.

PAGE LENGTH: 6 pages

LOCATION: Volume 22, Tab 14

DEFINITIONS: N/A

The Interim Enhanced Surface Water Treatment Rule (IESWTR) and Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) require all systems utilizing surface water or groundwater under the direct influence of surface water (GUDI) to achieve at least 2-log removal of *Cryptosporidium*. To ensure that the practice of recycling does not adversely affect the ability of a plant to meet this requirement, the Filter Backwash Recycling Rule (FBRR) requires that certain recycle flows in conventional and direct filtration facilities be returned to a location in the plant so the recycle flow passes through all of the treatment processes by June 8, 2004. The FBRR also allows the return of recycle flows to a location other than the head of the plant if DEP determines that use of the alternate location will not adversely affect the ability of the plant to achieve 2-log *Cryptosporidium* removal. This guidance was developed to aid permitting staff in evaluating requests to recycle to alternate locations.

A. Requests to use alternate recycle locations

The FBRR requires that the following three recycle flows be returned to the head of the plant: spent filter backwash, thickener supernatant and liquids from dewatering processes. The Environmental Protection Agency (EPA) has determined that these three recycle flows have sufficient pathogen concentrations and are generated in sufficient quantities to jeopardize removal of *Cryptosporidium* and other microbial pathogens if not recycled correctly. Because of the potential increase in the number of pathogens in the finished water, these three recycle flows should be returned to the head of the plant whenever such capability exists. The FBRR recognizes, however, that there may be legitimate reasons in some cases to introduce the recycled stream to other locations within the treatment plant.

Water suppliers seeking approval to return any of the regulated recycle flows at an alternate location are encouraged to submit their request as early as possible to allow review and approval by the June 8, 2004 deadline. The following information should be submitted to DEP when requesting use of an alternate recycle location:

- A written request explaining the reason and/or rationale for using the alternate recycle location (such as, the plant requires recycle to an alternate location to maintain optimal finished water quality or it is an essential component of treatment, as in lime softening), including an explanation of why the alternate recycle location would not or does not cause a negative impact upon the finished water quality.
- A plant schematic identifying the alternate recycle location.
- Demonstration of compliance with IESWTR/LT1ESWTR turbidity limits. This may be achieved through submission of combined filter effluent and/or individual filter effluent data.
- A description of the type of treatment(s) applied to the recycle flows (if any).

- A comparison of the plant influent water quality to the recycle flow water quality. Parameters for comparison may include, but are not limited to:
 - Turbidity,
 - Cysts and oocysts,
 - Cyst and oocyst-sized particles,
 - Iron and/or manganese,
 - Disinfection byproduct (DBP) levels,
 - Level of organic matter (TOC, DOC, UV254) and,
 - pH.
- Information on sedimentation performance (as evidenced by settled water turbidity as related to recycle practices).
- Design and monitoring data for the alternate recycle location.
- Information on the current loading rates of unit processes, and the impact to the loading rates caused by the alternate location.
- Information on flow control during recycle.
- An analysis of other impacts that the alternate location may have on finished water quality.

B. Evaluating requests to use alternate recycle locations

DEP's permitting staff has the discretion to either approve or disapprove the use of an alternate recycle location. A decision to approve an alternate recycle stream return location should be based on the determination that use of the alternate location will not disrupt the chemical treatment and coagulation process or otherwise negatively impact plant performance.

In evaluating requests for use of an alternate recycle location, the relative *Cryptosporidium* concentrations and flow rates of the raw water versus the recycle flows should be considered. Recycle flows returned to alternate locations should have *Cryptosporidium* concentrations and flow rates such that the blended water will have a *Cryptosporidium* concentration that is no higher than that of the raw water. It is important to note, however, that the FBRR does not mandate any specific level of pathogen removal from the three wastewater streams prior to recycle.

1. *Cryptosporidium* concentrations

The water supplier will often have insufficient data to characterize the oocyst loadings in their recycle flows. Lacking that data, it may be useful to consider information on oocyst

loadings presented in the American Water Works Association Research Foundation's (AWWARF) Treatment Options for Giardia, Cryptosporidium, and Other Contaminants in Recycled Backwash Water (2001). For example, a conventional filter plant that creates 2 percent filter backwash water produces a backwash water that theoretically contains 5 times the oocyst loading of the raw water. A direct filtration facility, treating the same source water without the benefit of sedimentation, produces backwash water with an oocyst loading of 50 times that of the raw. To achieve the goal of recycling to an alternate location while creating a blended water *Cryptosporidium* concentration of no more than the raw water, treatment of the recycle flows is generally necessary.

Treatment Options for Giardia, Cryptosporidium, and Other Contaminants in Recycled Backwash Water also provides generalized particle and turbidity log reduction capabilities of various recycle treatment schemes:

Range of Turbidity and Particle Log Reductions by Treatment Type

Process option:	Turbidity log reduction:	Particle log reduction:
Sedimentation w/o polymer	0.1 to 0.8	0.2 to 0.9
DAF w/o polymer	0.7 to 1.4	0.8 to 1.7
Sedimentation with polymer	1.4 to 2.3	1.9 to 3.3
DAF with polymer	1.7 to 2.7	1.9 to 3.5
Coagulation followed by sedimentation	0.5 to 1.7	0.4 to 2.1
Filtration with pretreatment using		
DAF or sedimentation with polymer	2.2 to 3.0	2.4 to 4.4
Membrane microfiltration	2.6 to 3.9	1.6 to 3.5

Staff are not limited to using the treatment capacities listed above, especially if they have on-site data to show the recycle treatment at a given facility performs differently.

2. Flow rates

The rate of return of the recycle flow is obviously an important factor in the impact to the treatment process. A recycle flow with a *Cryptosporidium* concentration that is less than the raw would allow a recycle flow rate at any proportion of the raw flow rate without increasing the blended water *Cryptosporidium* concentration. (There are, of course, other ramifications of the relative flow rates that must be considered.) As the recycle flow *Cryptosporidium* concentration increases, however, the relative rate of recycle must decrease if the system is to meet the goal of not increasing the blended water oocyst concentration above that of the raw water. For example, if the instantaneous recycle flow rate is 10 percent of the raw water flow, then a ten-fold dilution of *Cryptosporidium* and other protozoa in the recycle flow would result after blending. Although the optimum recycle ratio varies with the plant, most standards consider a rate of 10 percent or less to be acceptable.

In summary, the important factors in reducing the blended water *Cryptosporidium* loading are first to reduce the recycle flow rate as much as possible (usually through

continuous, not intermittent recycle) and then to appropriately treat the waste streams for oocyst removal prior to recycle.

3. Filter Plant Performance Evaluations

DEP has conducted Filter Plant Performance Evaluations (FPPEs) at almost all of the filter plants that utilize surface water or GUDI sources. The findings of the most recent FPPE for the subject plant should be considered when evaluating a request to utilize an alternate recycle location. Plants that have *commendable* or *satisfactory* ratings are meeting regulatory requirements and most optimization goals and therefore should be considered viable candidates for using alternate recycle locations. Plants that have a rating of *needs improvement* have deficiencies that affect their ability to meet those goals and requirements. DEP should carefully evaluate these facilities before approving use of an alternate recycle location. At the very least, these plants should be returning recycle flows at rates of no more than 10 percent of the raw (preferably less than 5 percent) and with adequate flow controls.

4. Other factors to consider

Recycle flow *Cryptosporidium* concentration, relative flow rates and the recent performance of the plant are the most important factors for DEP staff to consider when evaluating a request to utilize an alternate recycle location. Each facility is different, however, and there may be other factors that make recycling to an alternate location more or less acceptable for that facility. Other factors that could be considered include:

- If not able to return water to the head of the plant, why does the water supplier want to recycle at all? What is the purpose of the recycle? Is it an effort to conserve water? Reduce disposal costs? Reduce chemical costs? Is it a demand-driven consideration?
- Why does the water supplier want to recycle to a location other than the head of the plant? Does the plant have unique treatment requirements or processes that require the return of recycle streams to an alternate location?
- Has the water supplier evaluated their operations to minimize the amount of wastewater that must be generated?
- Has the water supplier evaluated how much recycling will increase other contaminants, including: TOC, TTHMs/precursors, HAA5s, turbidity, aluminum, iron and manganese? For example, Treatment Options for Giardia, Cryptosporidium, and Other Contaminants in Recycled Backwash Water states that plants using PACl will have much higher Al and Fe in recycle (55x) than those using alum (22-12x).
- Is the request to utilize an alternate recycle location for a direct filtration facility? Treatment of recycle streams is of utmost importance for direct filtration systems. Lacking the sedimentation step, any solids that enter the process are either deposited onto the filter or travel through the filter. If the recycle flow is not adequately treated before being returned to the treatment train, significant

numbers of oocysts captured on a filter during a filter run will be returned to the plant and pathogen concentration can occur.

- In some cases, DEP may have inadequate information to fully assess the impact of recycling to an alternate location. It may also be difficult for the system to recycle to a point prior to coagulation. Permitting staff may wish to issue a conditional or limited duration approval to recycle to the alternate location with the requirement that the water supplier collect and provide specified data to allow DEP to make a final decision regarding the appropriate recycling location.
- EPA's *Filter Backwash Recycling Rule Technical Guidance Manual* (December 2002) lists three locations that can be used to comply with the requirement to return recycle flows prior to coagulation: into the raw water before any pretreatment, after pretreatment but before coagulation, and into the coagulation reactor itself. Some filter plants have remote pretreatment facilities for taste/odor or iron/manganese control. Return of regulated recycle flows downstream from these pretreatment facilities but before or concurrent with coagulation should be considered return to the "head of the plant" for purposes of the FBRR and not use of an alternate location.