Area-Wide Optimization Program Microbial Optimization Goals and Guidelines: Rapid Rate, Membrane, and Slow Sand Filtration

Monitoring & Operating Goals Summary

Category	Goal/Guideline	Status	Description	References
Rapid-Rate Filtration	Raw Water Turbidity Monitoring Goal	Adopted	• Record maximum daily raw water turbidity.	U.S. Environmental Protection Agency, 2004
Rapid-Rate Filtration	Individual Sedimentation Basin Monitoring Goal	Adopted	• Record individual sedimentation basin effluent turbidity readings at intervals of 4-hours or less if taking grab samples, or 15-minutes or less for continuous monitoring.	U.S. Environmental Protection Agency, 2004
Rapid-Rate Filtration	Individual Filter Effluent (IFE) and Combined Filter Effluent (CFE) Monitoring Goals	Adopted	• Record IFE and CFE turbidity readings at intervals of 1-minute or less for continuous monitoring.	U.S. Environmental Protection Agency, 2004
Rapid-Rate Filtration	Disinfection Monitoring Goal	Adopted	• Record disinfectant residual, temperature, and pH at maximum daily flow for CT calculations.	U.S. Environmental Protection Agency, 2004
Membrane Filtration	Membrane Operational Guidelines	Proposed	• Permeability: Normalized permeability recovery after cleaning ≥ 90% of normalized permeability when newly installed.	U.S. Environmental Protection Agency, 2005
Slow Sand Filtration	Slow Sand Monitoring Goals	Proposed	• Collect weekly IFE total coliform (TC) and *E. coli* samples prior to disinfection. • Collect daily IFE and CFE turbidity measurements. • Collect TC samples from the plant effluent weekly when IFE or CFE turbidity is > 1.0 NTU. • Monitor hydraulic loading rate. • Monitor filter effluent dissolved oxygen.	Oregon Department of Public Health, 2015 Washington Department of Health, 2018
Slow Sand Filtration	Slow Sand Operational Guideline	Proposed	• Filter-to-waste (FTW) one hour for each hour the filter is offline, but ≥ 24 hours, until the following have been met: 1) IFE TC ≤ 5/100 mL after 24 hours; 2) IFE *E. coli* = absent; 3) IFE turbidity ≤ 1.0 NTU. • Maintain consistent hydraulic loading rate and minimize rapid changes. Limit hydraulic loading rate to 0.10 gpm/ft$^{2.}$ • Maintain at least 3 mg/L DO in filter effluent	Oregon Department of Public Health, 2015 Washington Department of Health, 2018

Performance Goals & Guidelines Summary

Category	Goal/Guideline	Status	Description	References
Rapid-Rate Filtration	Individual Sedimentation Performance Goals	Adopted	• Settled water turbidity ≤ 2.0 NTU in 95% of readings when the annual average raw turbidity is > 10 NTU. Performance is assessed based on the daily maximum values recorded from all readings. • Settled water turbidity ≤ 1.0 NTU in 95% of readings when the annual average raw turbidity is ≤ 10 NTU. Performance is assessed based on the daily maximum values recorded from all readings.	U.S. Environmental Protection Agency, 2004
Rapid-Rate Filtration	IFE and CFE Performance Goals	Adopted	• CFE turbidity ≤ 0.10 NTU in 95% of readings. Performance is assessed based on the daily maximum values recorded from all readings. • IFE turbidity ≤ 0.10 NTU in 95% of readings (excluding 15-minute period following filter backwash). Performance is assessed based on the daily maximum values recorded from all readings. • Post backwash IFE turbidity for filters without FTW capability: Maximum IFE turbidity following backwash ≤ 0.30 NTU and achieve ≤ 0.10 NTU within 15 minutes. • Post backwash IFE turbidity for filters with FTW capability: Minimize IFE turbidity during FTW period and record maximum value. Return the filter to service at ≤ 0.10 NTU.	U.S. Environmental Protection Agency, 2004
Rapid-Rate Filtration	Disinfection Performance Goal	Adopted	• Meet CT requirements to achieve inactivation of *Giardia* and viruses plus a system-specific factor of safety.	U.S. Environmental Protection Agency, 2004
Membrane Filtration	Membrane Performance Goals	Proposed	• Direct Integrity: Log Removal Value (LRV) should be ≥ 4.0-log and ≥ the removal credit awarded by the regulatory agency. • Indirect Integrity: Turbidity ≤ 0.05 NTU based on continuous monitoring. • Indirect Integrity (Alternate): Particle counts ≤ 10 particles/mL in the 1-3 µm range.	U.S. Environmental Protection Agency, 2005
Slow Sand Filtration	Slow Sand Performance Goals	Proposed	• IFE TC counts ≤ 5/100 mL and absence of *E. coli*, based on weekly samples. • IFE and CFE turbidity ≤ 1.0 NTU in 95% of highest daily readings. • IFE and CFE turbidity ≤ 5.0 NTU in all readings. • Plant effluent is absent of total coliform, based on weekly samples whenever IFE or CFE turbidity is > 1 NTU.	Oregon Department of Public Health, 2015 Washington Department of Health, 2018

References:

Oregon Department of Public Health. (2015, April 2). *Draft Slow Sand Filtration Optimization Goals and Guidelines.* (E. E. Hofeld, Ed.) Retrieved from Oregon Department of Health Web Site: https://www.oregon.gov/oha/ph/HealthyEnvironments/DrinkingWater/Operations/Treatment/Documents/slowsand/draftoptgoals.pdf

U.S. Environmental Protection Agency. (2004). *Optimizing Water Treatment Plant Performance Using the Composite Correction Program.* Cincinnati: U.S. EPA. doi:EPA/625/6

U.S. Environmental Protection Agency. (2005). *Membrane Filtration Guidance Manual.* Cincinnati, Ohio: U.S. Environmental Protection Agency. doi:EPA 815-R-06-009

Washington Department of Health. (2018, June 12). *Recommended Operations and Optimization Goals for Slow Sand Filtration.* Retrieved from Washington Department of Health Web Site: https://www.doh.wa.gov/Portals/1/Documents/Pubs/331-601.pdf