EPA-APPROVED VIRGINIA REGULATIONS AND STATUTES

State citation	Title/subject	State effective date	EPA approval date	Explanation [former SIP citation]
*	*	*	*	* * *
9 VAC 5, Chapter 20 General Provisions				
*	*	*	*	* * *
Part II Air Quality Programs				
*	*	*	*	* * *
5–20–204	Nonattainment Areas	2/15/23	7/23/2024, [Insert **Federal Register** Citation].	List of nonattainment areas revised to include Giles County locality for the primary sulfur dioxide standard.
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[FR Doc. 2024–16121 Filed 7–22–24; 8:45 am]

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ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 141

[EPA–HQ–OW–2023–0572; FRL 7946–01–OW]

National Primary Drinking Water Regulations; Announcement of the Results of EPA's Fourth Review of Existing Drinking Water Standards

AGENCY: Environmental Protection Agency (EPA).

ACTION: Results of regulatory review.

SUMMARY: The Safe Drinking Water Act (SDWA) requires the U.S. Environmental Protection Agency (EPA or the agency) to conduct a review every six years of existing national primary drinking water regulations (NPDWRs) and determine which, if any, are appropriate for revision. The purpose of the review, called the Six-Year Review, is to evaluate available information for regulated contaminants to determine if any new information on health effects, treatment technologies, analytical methods, occurrence, exposure, implementation, and/or other factors provides a basis to support a regulatory revision that would improve or strengthen public health protection. While EPA has recently completed several significant revisions to existing regulations and other regulatory revisions are currently underway, based on this periodic review of all NPDWRs, there are no additional candidates for regulatory revision at this time.

DATES: July 23, 2024.

ADDRESSES: EPA is not accepting public comment on the review results.

FOR FURTHER INFORMATION CONTACT: Samuel Hernandez, Environmental Protection Agency, Office of Ground Water and Drinking Water, Standards and Risk Management Division, (Mail Code 4607M), 1200 Pennsylvania Avenue NW, Washington, DC 20460; telephone number: (202) 564–1735; email address: *hernandez.samuel@epa.gov.*

SUPPLEMENTARY INFORMATION:

Abbreviations and acronyms: The following acronyms and abbreviations are used throughout this document.

2,4-D—2,4-Dichlorophenoxyacetic acid
ADWR—Aircraft Drinking Water Rule
BAT—Best Available Technology
CFR—Code of Federal Regulations
CVOC—Carcinogenic Volatile Organic Contaminant
CWS—Community Water System
DBCP—1,2-Dibromo-3-Chloropropane
DBP—Disinfection Byproduct
DEHA—Di(2-ethylhexyl)adipate
DEHP—Di(2-ethylhexyl)phthalate
EPA—U.S. Environmental Protection Agency
EQL—Estimated Quantitation Level
FBRR—Filter Backwash Recycling Rule
GWR—Ground Water Rule
HAA5—Haloacetic Acids (five) (sum of monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid)
ICR—Information Collection Request
IRIS—Integrated Risk Information System
LT2—Long-Term 2 Enhanced Surface Water Treatment Rule
MCLG—Maximum Contaminant Level Goal
MCL—Maximum Contaminant Level
MDBP—Microbial and Disinfection Byproduct
MDL—Method Detection Limit
MRDLG—Maximum Residual Disinfectant Level Goal
MRDL—Maximum Residual Disinfectant Level
MRL—Minimum Reporting Level
NAS—National Academy of Sciences
NCWS—Non-Community Water System
NDWAC—National Drinking Water Advisory Council
NPDWR—National Primary Drinking Water Regulations
NRC—National Research Council
NTP—National Toxicology Program
PCBs—Polychlorinated biphenyls
PCE—Tetrachloroethylene
PQL—Practical Quantitation Limit
PT—Proficiency Testing
PWS—Public Water System
RfD—Reference Dose
RSC—Relative Source Contribution
RTCR—Revised Total Coliform Rule
SDWA—Safe Drinking Water Act
SDWIS—Safe Drinking Water Information System
SWTR—Surface Water Treatment Rule
TCDD—Tetrachlorodibenzo-p-dioxin
TCE—Trichloroethylene
TCR—Total Coliform Rule
TNCWS—Transient Non-Community Water System
TTHM—Total Trihalomethanes (sum of four THMs: chloroform, bromodichloromethane, dibromochloromethane, and bromoform)
TT—Treatment Technique
USGS—U.S. Geological Survey

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I. General Information

A. Does this action apply to me?

This action itself does not impose any requirements on individual people or entities. Instead, it notifies interested parties of EPA's review of existing national primary drinking water regulations (NPDWRs) and its conclusions about which of these NPDWRs may warrant regulatory revisions at this time. The Six-Year Review is not a final regulatory decision to revise or not revise an NPDWR, but rather a planning process that involves more detailed analyses of factors relevant to deciding whether a rulemaking to revise an NPDWR should be initiated.

B. How can I get copies of this document and other related information?

1. *Docket.* EPA has established a docket for this action under Docket ID No. EPA–HQ–OW–2023–0572. Publicly available docket materials are available electronically on *www.regulations.gov* or in hard copy at the EPA Docket Center, WJC West Building, Room 3334, 1301 Constitution Ave. NW, Washington, DC. The Docket Center's hours of operations are 8:30 a.m. to 4:30 p.m., Monday through Friday (except Federal Holidays). For further information on the EPA Docket Center services and the current status see*: https://www.epa.gov/dockets.*

2. *Electronic Access.* You may access this **Federal Register** document electronically from *https://www.federalregister.gov.*

II. Statutory Requirements for the Six-Year Review

Under the Safe Drinking Water Act (SDWA), as amended in 1996, EPA must periodically review existing NPDWRs and, if appropriate, revise them. Section 1412(b)(9) of the SDWA states: ''The Administrator shall, not less often than every six years, review and revise, as appropriate, each national primary drinking water regulation promulgated under this title. Any revision of a national primary drinking water regulation shall be promulgated in accordance with this section, except that each revision shall maintain, or provide for greater, protection of the health of persons.''

Pursuant to the 1996 SDWA Amendments, EPA completed and published the results of its first Six-Year Review (Six-Year Review 1) on July 18, 2003 (68 FR 42908, USEPA, 2003), the second Six-Year Review (Six-Year Review 2) on March 29, 2010 (75 FR 15500, USEPA, 2010a) and the third Six-Year Review (Six-Year Review 3) on January 11, 2017 (82 FR 3518, USEPA, 2017a).

During the Six-Year Review 1, EPA identified the Total Coliform Rule (TCR) as a candidate for revision.[1] In Six-Year Review 2, EPA identified four NPDWRs corresponding to acrylamide, epichlorohydrin, tetrachloroethylene (PCE), and trichloroethylene (TCE) as candidates for revision. In Six-Year Review 3, eight NPDWRs were listed as candidates for revision, including: chlorite, *Cryptosporidium* (under SWTRs), *Giardia lamblia,* haloacetic acids (HAA5), heterotrophic bacteria, *Legionella,* total trihalomethanes (TTHM), and viruses (under SWTRs). EPA also announced that the NPDWRs for acrylamide and epichlorohydrin were no longer candidates for revision due to low opportunity for further reduction of public health risk through regulatory revision (82 FR 3525, USEPA, 2017a).

In this document, EPA is announcing the results of the fourth Six-Year Review (Six-Year Review 4). EPA's announcement of whether to identify an NPDWR as a candidate for revision (pursuant to SDWA section 1412(b)(9)) is not a regulatory decision. Instead, announcing that an NPDWR is a candidate for revision formally initiates a regulatory process that involves more detailed analyses of health effects, analytical constraints, treatment feasibility, occurrence, benefits, costs, and other policy considerations relevant to informing an NPDWR revision effort. The Six-Year Review results do not obligate the agency to revise an NPDWR if EPA determines during the regulatory process that revisions are no longer appropriate and discontinues further efforts to revise the NPDWR. Similarly, when EPA announces that a particular NPDWR has not been identified as a candidate for revision it means that the agency has concluded that it is not appropriate for revision at this time based on available information.

The criteria that EPA has applied to help identify when an NPDWR might be considered as a ''candidate for revision'' are, at a minimum, that the regulatory revision presents a meaningful opportunity to improve the level of public health protection, and/or achieve cost savings while maintaining or improving the level of public health protection.

III. Regulations Included in the Six-Year Review 4

Table 1 of this document lists all 94 NPDWRs established to date. The table also reports the maximum contaminant level goal (MCLG) and, where applicable, the maximum contaminant level (MCL). The MCLG is ''set at the level at which no known or anticipated adverse effects on the health of persons occur and which allows an adequate margin of safety'' (SDWA section 1412(b)(4)). The MCL for each applicable NPDWR, is the maximum permissible level of a contaminant in water delivered to any user of a public water system (PWS) and generally ''is as close to the maximum contaminant level goal as is feasible'' (SDWA section 1412(b)(4)(B)). If it is not ''economically or technically feasible to ascertain the level of the contaminant,'' EPA can require the use of a treatment technique (TT) in lieu of establishing an MCL. The treatment technique(s) must prevent known or anticipated adverse health effects ''to the extent feasible'' (SDWA section 1412(b)(7)(A)).[2] In the case of disinfectants (*e.g.,* chlorine, chloramines, chlorine dioxide), the values reported in the table are not MCLGs and MCLs, but maximum residual disinfectant level goals (MRDLGs) and maximum residual disinfectant levels (MRDLs).

[1] The NPDWRs apply to specific contaminants/parameters or groups of contaminants. Historically, when issuing new or revised standards for these contaminants/parameters, EPA has often grouped the standards together in more general regulations, such as the Total Coliform Rule, the Surface Water Treatment Rule or the Phase V rules. In this action, however, for clarity, EPA discusses the drinking water standards as they apply to each specific regulated contaminant/parameter (or group of contaminants), not the more general regulation in which the contaminant/parameter was regulated.

[2] Under limited circumstances, SDWA section 1412(b)(6)(A) gives the Administrator the discretion to promulgate an MCL or TT that is less stringent than the most protective feasible standard that ''maximizes health risk reduction benefits at a cost that is justified by the benefits.'' Similarly, SDWA section 1412(b)(5) authorizes the Administrator to promulgate an MCL or TT that is less stringent than the most protective feasible standard if the more protective standard would increase the level of other contaminants in drinking water or interfere with the efficacy of treatment techniques or process used for compliance with other NPDWRs. Under those circumstances, EPA is to promulgate feasible a MCL or TT rule to ''minimize the oversall risk of adverse health effects'' while avoiding an increase in health risks from other contaminants.

As part of the fourth Six-Year Review, EPA did not consider information after December 2021, unless otherwise noted. EPA identified 15 NPDWRs for which there has either been a recently completed, an ongoing, or a pending regulatory action. EPA did not conduct a detailed review of these 15 NPDWRs for the Six-Year Review 4. These include the ongoing Lead & Copper rulemaking activities and the potential revisions [3] of the Microbial and Disinfection Byproduct Rules (MDBP). The MDBP effort contemplates potential regulatory revisions for the NPDWRs covering the following contaminants: (Bromate, Chloramines, Chlorine Dioxide, Chlorine, Chlorite, Cryptosporidium, Giardia lamblia, Haloacetic acids, Heterotrophic bacteria, Legionella, Total Trihalomethanes, Turbidity, & Viruses).

The EPA did not include in this Six-Year Review cycle the recently promulgated per-and polyfluoroalkyl substances (PFAS) regulations.[4] The PFAS regulations, promulgated in April 2024, established 6 new NPDWRs. The EPA anticipates that once the PFAS regulations go into effect and sufficient information regarding compliance monitoring becomes available, those NPDWRs will be subject to a more detailed regulatory review under a future Six-Year Review cycle. This document describes the detailed review of the remaining 73 NPDWRs. section IV of this document describes the Six-Year Review 4 protocol, and section V of this document describes the review results. Please see USEPA (2024a) for more details.

TABLE 1—LIST OF NPDWRS

Contaminants/parameters	MCLG (mg/L) [1] [3]	MCL or TT (mg/L) [2] [3]	Contaminants/parameters	MCLG (mg/L) [1] [3]	MCL or TT (mg/L) [2] [3]
Acrylamide	0	TT	*Giardia lamblia* [4]	0	TT.
Alachlor	0	0.002	Glyphosate	0.7	0.7.
Alpha/photon emitters	0 (pCi/L)	15 (pCi/L)	Haloacetic acids (HAA5)	n/a [5]	0.060.
Antimony	0.006	0.006	Heptachlor	0	0.0004.
Arsenic	0	0.010	Heptachlor epoxide	0	0.0002.
Asbestos	7 (million fibers/L)	7 (million fibers/L)	Heterotrophic bacteria [6]	n/a	TT.
Atrazine	0.003	0.003	Hexachlorobenzene	0	0.001.
Barium	2	2	Hexachlorocyclopentadiene	0.05	0.05.
Benzene	0	0.005	Hexafluoropropylene oxide dimer acid (HFPO–DA).	10 (ppt)	10 (ppt).
Benzo[a]pyrene	0	0.0002	Lead	0	TT.
Beryllium	0.004	0.004	*Legionella*	0	TT.
Beta/photon emitters	0 (millirems/yr)	4 (millirems/yr)	Lindane	0.0002	0.0002.
Bromate	0	0.010	Mercury (inorganic)	0.002	0.002.
Cadmium	0.005	0.005	Methoxychlor	0.04	0.04.
Carbofuran	0.04	0.04	Monochlorobenzene (Chlorobenzene)	0.1	0.1.
Carbon tetrachloride	0	0.005	Nitrate (as N)	10	10.
Chloramines (as Cl_2)	4	4.0	Nitrite (as N)	1	1.
Chlordane	0	0.002	Oxamyl (Vydate)	0.2	0.2.
Chlorine (as Cl_2)	4	4.0	Pentachlorophenol	0	0.001.
Chlorine dioxide (as ClO_2)	0.8	0.8	Perfluorohexane sulfonic acid (PFHxS).	10 (ppt)	10 (ppt).
Chlorite	0.8	1.0	Perfluorononanoic acid (PFNA)	10 (ppt)	10 (ppt).
Chromium (total)	0.1	0.1	Perfluorooctane sulfonic acid (PFOS)	0 (ppt)	4.0 (ppt).
Copper	1.3	TT	Perfluorooctanoic acid (PFOA)	0 (ppt)	4.0 (ppt).
Cryptosporidium	0	TT	PFAS Mixture (HFPO–DA, PFBS, PFHxS, & PFNA).	Hazard Index [12] of 1.	Hazard Index of 1.
Cyanide (as free cyanide)	0.2	0.2	Picloram	0.5	0.5.
2,4-Dichlorophenoxyacetic acid (2,4-D)	0.07	0.07	Polychlorinated biphenyls (PCBs)	0	0.0005.
Dalapon	0.2	0.2	Radium 226/228 (combined)	0 (pCi/L)	5 (pCi/L).
Di(2-ethylhexyl)adipate (DEHA)	0.4	0.4	Selenium	0.05	0.05.
Di(2-ethylhexyl)phthalate (DEHP)	0	0.006	Simazine	0.004	0.004.
1,2-Dibromo-3- chloropropane (DBCP)	0	0.0002	Styrene	0.1	0.1.
1,2-Dichlorobenzene (o-Dichlorobenzene).	0.6	0.6	2,3,7,8-TCDD (Dioxin)	0	3×10^{-8}.
1,4-Dichlorobenzene (p-Dichlorobenzene).	0.075	0.075	Tetrachloroethylene	0	0.005.
1,2-Dichloroethane (ethylene dichloride).	0	0.005	Thallium	0.0005	0.002.
1,1-Dichloroethylene	0.007	0.007	Toluene	1	1.
cis-1,2-Dichloroethylene	0.07	0.07	Total coliforms [7] [8]	n/a	TT.
trans-1,2-Dichloroethylene	0.1	0.1	Total Trihalomethanes (TTHM)	n/a [9]	0.080.
Dichloromethane (methylene chloride)	0	0.005	Toxaphene	0	0.003.
1,2-Dichloropropane	0	0.005	2,4,5-TP (Silvex)	0.05	0.05.
Dinoseb	0.007	0.007	1,2,4-Trichlorobenzene	0.07	0.07.
Diquat	0.02	0.02	1,1,1-Trichloroethane	0.2	0.2.
E. coli	0	MCL,[10] TT [8] [11]	1,1,2-Trichloroethane	0.003	0.005.
Endothall	0.1	0.1	Trichloroethylene	0	0.005.
Endrin	0.002	0.002	Turbidity [6]	n/a	TT.
Epichlorohydrin	0	TT	Uranium	0	0.030.
Ethylbenzene	0.7	0.7	Vinyl Chloride	0	0.002.
Ethylene dibromide (EDB)	0	0.00005	Viruses	0	TT.
Fluoride	4.0	4.0	Xylenes (total)	10	10.

[1] MCLG: the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health of persons would occur, allowing an adequate margin of safety. Maximum contaminant level goals are nonenforceable health goals.

[3] Additional information can be found at *https://www.epa.gov/system/files/documents/2022-04/mdbp-rule-revisions-charge-to-the-ndwac.pdf.*

[4] On April 26, 2024, the EPA promulgated legally enforceable drinking water standards to address PFAS known to occur individually and as mixtures in drinking water (89 FR 32532). The NPDWRs sets limits for five individual PFAS: (perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), perfluorohexane sulfonic acid (PFHxS), perfluorononanoic acid (PFNA), hexafluoropropylene oxide dimer acid (HFPO–DA, commonly known as GenX Chemicals)); and also established a limit for mixtures of any two or more of the following four PFAS: (PFNA, PFHxS, perfluorobutane sulfonic acid (PFBS), and HFPO–DA).

[2] MCL: the maximum level allowed of a contaminant in water which is delivered to any user of a public water system. TT: any action, process, or procedure required of the water system that leads to the reduction of the level of a contaminant in tap water that reaches the consumer.

[3] Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million. For chlorine, chloramines, and chlorine dioxide, values presented are MRDLG and MRDL.

[4] The current preferred taxonomic name is *Giardia duodenalis,* with *Giardia lamblia* and *Giardia intestinalis* as synonymous names. However, *Giardia lamblia* was the name used to establish the MCLG in 1989. Elsewhere in this document, this pathogen will be referred to as *Giardia spp.* or simply *Giardia* unless discussing information on an individual species.

[5] There is no MCLG for all five haloacetic acids. MCLGs for some of the individual contaminants are: dichloroacetic acid (zero), trichloroacetic acid (0.02 mg/L), and monochloroacetic acid (0.07 mg/L). Bromoacetic acid and dibromoacetic acid are regulated with this group but have no MCLGs.

[6] Includes indicators that are used in lieu of direct measurements (*e.g.,* of heterotrophic bacteria, turbidity).

[7] The Aircraft Drinking Water Rule (ADWR) 40 CFR part 141 subpart X, promulgated October 19, 2009, covers total coliforms and *E. coli.*

[8] Under the RTCR, a PWS is required to conduct an assessment if it exceeded any of the TT triggers identified in 40 CFR 141.859(a). It is also required to correct any sanitary defects found through the assessment. 40 CFR 141.859(c).

[9] There is no MCLG for total trihalomethanes (TTHM). MCLGs for some of the individual contaminants are: bromodichloromethane (zero), bromoform (zero), dibromochloromethane (0.06 mg/L), and chloroform (0.07 mg/L).

[10] A PWS is in compliance with the *E. coli* MCL unless any of the conditions identified under 40 CFR 141.63(c) occur.

[11] Under the GWR in 40 CFR 141.402, a ground water system that does not provide at least 4-log treatment of viruses and has a distribution system RTCR sample that tests positive for total coliform is required to conduct triggered source water monitoring to evaluate whether the total coliform presence in the distribution system is due to fecal contamination in the ground water source. The system must monitor for one of three State-specified fecal indicators (*i.e., E. coli,* coliphage, or enterococci).

[12] The Hazard Index is an approach that EPA uses to determine the health concerns associated with mixtures of certain PFAS in finished drinking water. The Hazard Index is made up of a sum of fractions. Each fraction compares the level of each PFAS measured in the water to the associated health-based water concentration.

IV. EPA's Protocol for Reviewing the NPDWRs Included in This Action

A. What was EPA's review process?

This section provides an overview of the process EPA used to review the NPDWRs discussed in this document. The protocol document, ''EPA Protocol for the Fourth Review of Existing National Primary Drinking Water Regulations,'' contains a detailed description of the process the agency used to review the NPDWRs (USEPA, 2024c). The foundation of this protocol was developed for the Six-Year Review 1 based on the recommendations of the National Drinking Water Advisory Council (NDWAC, 2000) and has undergone minor clarifications during each Six-Year Review cycle (USEPA, 2024c). Figure 1 presents an overview of the Six-Year Review protocol and the possible review outcomes.

The objective of the Six-Year Review process is to identify and prioritize NPDWRs for possible regulatory revision. The two major outcomes of the detailed review are either (1) the NPDWR is not appropriate for revision and no action is necessary at this time or (2) the NPDWR is a candidate for revision.

The reasons why EPA might list an NPDWR as ''not appropriate for revision at this time'' could include:

- *Recently completed, ongoing, or pending regulatory action:* The NPDWR was recently completed, is being reviewed under an ongoing action, or is subject to a pending action.
- *Ongoing or planned health effects assessment:* The contaminant or contaminants regulated by the NPDWR has an ongoing or planned health effects assessment.
- *No new information:* EPA did not identify any new relevant information for the contaminant since the last Six-Year Review that indicates changes to the NPDWR may be appropriate.
- *Data gaps/emerging information:* New information indicates a possible change to the MCLG and/or MCL but changes to the NPDWR are not appropriate due to data gaps and emerging information that needs to be evaluated.
- *Low priority and/or no meaningful opportunity:* New information indicates a possible change to the MCLG and/or MCL but changes to the NPDWR are not appropriate at this time due to one or more of the following reasons: (1) possible changes present negligible gains in public health protection; (2) possible changes present limited opportunity for cost savings while maintaining the same or greater level of health protection; and/or (3) possible changes are a low priority because of competing workload priorities, limited return on the administrative costs associated with rulemaking, and the burden on states and the regulated community associated with implementing any regulatory change that would result.

Alternatively, the reasons why an NPDWR could be listed as a candidate for revision are that the regulatory revision presents a meaningful opportunity to improve the level of public health protection, and/or achieve cost savings while maintaining or improving the level of public health protection.

Individual regulatory provisions that are evaluated as part of the Six-Year Review process include: MCLG, MCL, MRDLG, MRDL, TT, best available technology (BAT), and other requirements, such as monitoring requirements.

For example, the microbial regulations include TT requirements because no reliable, affordable, and technically feasible method is available to measure the microbial contaminants covered by those regulations. These TT requirements rely on the use of indicators that can be measured in drinking water, such as detection of total coliforms as an indicator of a potential pathway for pathogenic contamination in the distribution system. As part of the Six-Year Review 4, EPA evaluated new information related to the use of those indicators to determine if a meaningful opportunity to improve the level of public health protection exists. Results of EPA's review of the microbial regulations are presented in section V of this document.

Basic Principles

EPA applied several basic principles to the Six-Year Review process:

- The agency sought to avoid redundant review efforts. Because EPA has reviewed information for certain NPDWRs as part of recently completed, ongoing, or pending regulatory actions, these NPDWRs were not subject to detailed review under the Six-Year Review process.
- The agency does not believe it is appropriate to consider revisions to NPDWRs for contaminants with an ongoing or planned health effect assessment where the MCL is set equal to the MCLG or that were set at the level at which health risk reduction benefits were maximized at a cost justified by the benefits in accordance with SDWA section 1412(b)(6)(A)). This principle stems from the fact that any new health effects assessment may affect the MCL via a change in the MCLG or the assessment of the benefits associated with the MCL. EPA notes that these NPDWRs are not appropriate for revision and no action is necessary if the health effects assessment would not be completed during the review cycle.
- In evaluating the potential for new information to affect NPDWRs, EPA assumed no change to existing policies and procedures for developing NPDWRs. For example, in determining whether new information affected the feasibility of analytical methods for a contaminant, the agency assumed no

change to current policies and procedures for calculating practical quantitation limits.

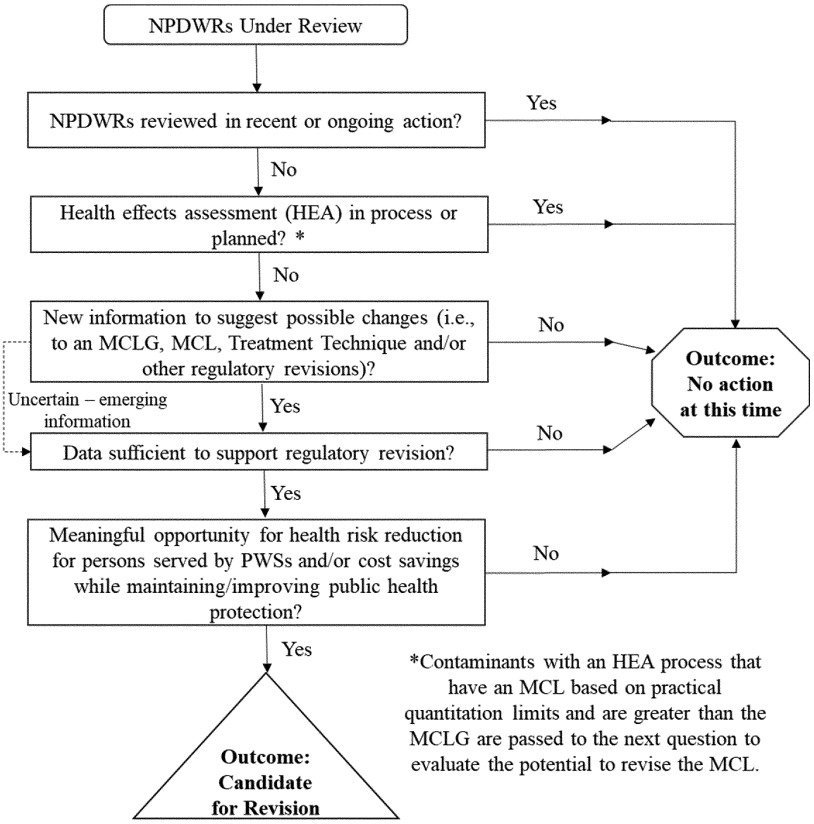
- EPA may consider whether there is new public health risk information to justify accelerating review and potential revision of a particular NPDWR before the next review cycle.

Procedures

EPA also applied the following procedures in the review process:

- EPA considered new information from health effects assessments that were completed by the information cutoff date. Assessments completed after this cutoff date will be reviewed by EPA during the next review cycle.
- During the review, EPA identified areas where relevant information, which is needed to determine whether a revision to an NPDWR may be appropriate, was either: inadequate, unavailable (*i.e.,* data gaps), or emerging. To the extent EPA is able to fill data gaps or fully evaluate the emerging information, the agency will consider the information as part of the next review cycle.
- Finally, EPA assured that the scientific analyses supporting the review were consistent with the agency's peer review policy (USEPA, 2015a).

Figure 1: Six-Year Review Protocol Overview and Review Outcomes



B. How did EPA conduct the review of the NPDWRs?

The protocol for the Six-Year Review 4 is organized as a series of questions to inform an assessment as to the appropriateness of revising an NPDWR. These questions are logically ordered into a decision tree. This section provides an overview of each of the review elements that EPA considered for each NPDWR during the Six-Year Review 4, including the following: initial review, health effects, analytical feasibility, occurrence and exposure, treatment feasibility, risk balancing, and other NPDWR revisions. The final review combines the findings from all these review elements to recommend whether an NPDWR is a candidate for revision. Further information about the review elements is described in the protocol document (USEPA, 2024c). The results of the Six-Year Review are presented in section V of this document.

1. Initial Review

EPA's initial review of all the contaminants included in the Six-Year Review 4 involved a simple identification of the NPDWRs that have either been recently completed or are being reviewed in an ongoing or pending action since the publication of Six-Year Review 3. In addition, the initial review also identified contaminants with ongoing health effects assessments that have an MCL equal to the MCLG. Excluding such contaminants from a more detailed review in the Six-Year Review 4 prevents duplicative agency efforts.

2. Health Effects

The principal objectives of the health effects review are to identify: (1) contaminants for which a new health effects assessment indicates that a change in the MCLG might be appropriate (*e.g.,* because of a change in cancer classification or a change in reference dose (RfD)), and (2) contaminants for which new health effects information indicates a need to initiate a new health effects assessment.

To meet the first objective, EPA reviewed the results of health effects assessments completed since promulgation of each NPDWR. To meet the second objective, the agency conducted a systematic literature search, to capture more recently published peer-reviewed studies on relevant health effects via the oral route

of exposure for the general population as well as sensitive subpopulations including children. The results of the literature search were used to survey the health effects literature that has become available since the previous review cycle, identify any emerging issues for a contaminant, and identify data gaps to inform future health assessment nominations.

3. Analytical Feasibility

When establishing an NPDWR, EPA identifies a practical quantitation limit (PQL), which is the lowest achievable level of analytical quantitation during routine laboratory operating conditions within specified limits of precision and accuracy (50 FR 46880, USEPA, 1985). EPA has a separate process in place to approve new analytical methods for drinking water contaminants; therefore, review and approval of potential new methods is outside the scope of the Six-Year Review protocol. EPA recognizes, however, that the approval and adoption in recent years of new and/or improved analytical methods may enable laboratories to quantify contaminants at lower levels than was possible when NPDWRs were originally promulgated. This ability of laboratories to measure a contaminant at lower levels could affect its PQL, the value at which an MCL is set when it is limited by analytical feasibility. Therefore, the Six-Year Review process includes an examination of whether there have been changes in analytical feasibility that could possibly change the PQL for the subset of the NPDWRs that reach this stage of the review.

To determine if changes in analytical feasibility could possibly support changes to PQLs, EPA relied primarily on two approaches to develop estimated quantitation levels (EQLs), which are based on either (1) minimum reporting levels (MRLs) obtained as part of the Six-Year Review 4 Information Collection Request (ICR), or (2) method detection limits (MDLs) from EPA-approved laboratory protocols.

An MRL is the lowest level or contaminant concentration that a laboratory can reliably achieve within specified limits of precision and accuracy under routine laboratory operating conditions using a given method. The MRL values provide direct evidence from actual monitoring results about whether quantitation below the PQL using current analytical methods is feasible. An MDL is a measure of analytical sensitivity, representing the minimum reported concentration that can be distinguished from blank results with 99 percent confidence. MDLs have been used in the past to derive PQLs for regulated contaminants.

EPA used the EQL as a threshold for occurrence analysis to help the agency assess for a meaningful opportunity to improve public health protection. It should be noted, however, that the use of an EQL does not necessarily indicate the agency's intention to promulgate a revised MCL based on the new PQL. Any change in the PQL for a contaminant could be part of future rulemaking efforts if EPA decides to initiate a regulatory revision for the contaminant.

4. Occurrence and Exposure Analysis

EPA conducted the occurrence and exposure analysis in conjunction with other review elements to determine if an NPDWR revision would provide a meaningful opportunity to improve public health by:

- estimating the extent of contaminant occurrence, *i.e.,* the number of PWSs in which contaminants occur at levels of interest (health-effects-based thresholds or analytical method limits), and;
- evaluating the number of people potentially exposed to contaminants at these levels.

To evaluate national contaminant occurrence under the Six-Year Review 4, EPA reviewed data from the Six-Year Review 4 ICR database (SYR 4 ICR database) and other relevant sources. EPA collected SDWA compliance monitoring data and treatment technique information through use of an ICR (84 FR 58381, USEPA, 2019). EPA requested that states, as well as Tribes and territories with primacy voluntarily submit their compliance monitoring data and treatment technique information for regulated contaminants in PWSs. Specifically, EPA requested the submission of compliance monitoring data, treatment technique information, and related details collected between January 2012 and December 2019 for regulated contaminants and related parameters (*e.g.,* water quality indicators). Forty-six states plus 13 other jurisdictions (Washington, DC, territories, and Tribes) provided data. The assembled data constitute the largest, most comprehensive set of drinking water compliance monitoring data and treatment technique information ever compiled and analyzed by EPA to inform decision making, containing almost 71 million analytical records from approximately 140,000 PWSs, serving approximately 301 million people nationally. Through extensive data management efforts, quality assurance evaluations, and communications with state data management staff, EPA established the SYR 4 ICR dataset (USEPA, 2019). The number of states and PWSs represented in the dataset varies across contaminants because of variability in state data submissions and contaminant monitoring schedules. EPA considers that these data are of sufficient quality to inform an understanding of the national occurrence of regulated contaminants and related parameters. Details of the data management and data quality assurance evaluations are available in the supporting document (USEPA, 2024d). The resulting database is available online on the Six-Year Review website at *https://www.epa.gov/dwsixyearreview.*

5. Treatment Feasibility

An NPDWR either identifies an MCL or establishes enforceable TT requirements. When promulgating an MCL or enforceable treatment technique requirements, to determine feasibility, EPA identifies the best technology, treatment techniques, and other means which EPA finds, after examination for efficacy under field conditions and not solely under laboratory conditions, are available (taking cost into consideration). When promulgating an MCL, EPA also lists the technology, treatment techniques, or other means which are feasible for purposes of meeting the MCL. EPA reviews treatment feasibility to ascertain if available technologies meet BAT criteria for a hypothetical more stringent MCL, or if new information demonstrates an opportunity to improve public health protection through revision of an NPDWR TT requirement.

To be a BAT, the treatment technology must meet several criteria such as having demonstrated consistent removal of the target contaminant under field conditions. Although treatment feasibility and analytical feasibility are considered together in evaluating the technical feasibility requirement for an MCL, historically, treatment feasibility has not been a limiting factor for MCLs. The result of this review element is a determination of whether treatment feasibility would pose a limitation to revising an MCL or provide an opportunity to revise the NPDWR TT requirement.

6. Risk-Balancing

EPA reviews the risk-balancing analysis underlying some NPDWRs to examine how a potential regulatory revision would address tradeoffs in risks associated with different contaminants. Under this review, EPA considers whether a change to an MCL and/or TT

will increase the public health risk posed by one or more contaminants, and, if so, the agency considers revisions that will balance overall risks. This review element is relevant only to the NPDWRs included in the microbial and disinfection byproduct (MDBP) rules, which were promulgated to address the need for risk-balancing between microbial and disinfection byproduct (DBP) requirements, and among differing types of DBPs. NPDWRs for microbials and disinfectants and DBPs were not reviewed during Six-Year Review 4 due to ongoing regulatory action initiated by Six-Year Review 3.

7. Other NPDWR Revisions

In addition to possible revisions to MCLGs, MCLs, and TTs, EPA evaluated whether other revisions are needed to other regulatory provisions in NPDWRs, such as monitoring and system reporting requirements. EPA focused this review element on issues that were not already being addressed through alternative mechanisms, such as a recently completed, ongoing, or pending regulatory action. EPA also reviewed implementation-related NPDWR concerns that were ''ready'' for rulemaking—that is, the problem to be resolved had been clearly identified, along with specific options to address the problem that could be shown to either clearly improve the level of public health protection or represent a meaningful opportunity for achieving cost savings while maintaining the same level of public health protection. The result of this review element is a determination regarding whether EPA should consider revisions to the monitoring and/or reporting requirements of an NPDWR.

V. Results of EPA's Review of NPDWRs

A. Overview of Six-Year Review 4 Results

Table 2 of this document, lists the results of EPA's review of the 88 NPDWRs assessed during Six-Year Review 4, along with the principal rationale for the review outcomes. Table 2 includes the 15 NPDWRs that have ongoing or pending regulatory actions.

TABLE 2—SUMMARY OF SIX-YEAR REVIEW 4 RESULTS

Outcome			Regulated contaminants	
Not Appropriate for Revision at this Time.	Recently completed, ongoing or pending regulatory action.		Bromate Chloramines (as Cl_2) Chlorine Dioxide (as ClO_2) Chlorine (as Cl_2) Chlorite Copper *Cryptosporidium* (IE, LT1)[1] *Giardia lamblia.*	Haloacetic acids (HAA5). Heterotrophic bacteria. Lead. *Legionella.* Total Trihalomethanes (TTHM). Turbidity. Viruses (SWTR, IE, LT1).[1]
Not Appropriate for Revision at this Time.	Health effects assessment in process or contaminant nominated for health assessment.		Alpha/photon emitters Arsenic Beta/photon emitters Chromium (total) Ethylbenzene	Mercury (inorganic). Polychlorinated biphenyls (PCBs). Radium 226/228 (combined). Uranium.
	No new information, NPDWR remains appropriate after review.		Asbestos Benzo(a)pyrene Chlorobenzene Dalapon Di(2-ethylhexyl)adipate (DEHA) Di(2-ethylhexyl)phthalate (DEHP) 1,2-Dibromo-3-chloropropane (DBCP)	trans-1,2-Dichloroethylene. Dinoseb. *E. coli.* Endrin. Ethylene dibromide. 2,4,5-TP (Silvex).
	New information, but no revision recommended because . . .	Low priority and/or no meaningful opportunity.	Acrylamide Alachlor Antimony Atrazine Barium Benzene Beryllium Cadmium Carbofuran Carbon Tetrachloride Chlordane *Cryptosporidium (LT2)*[1] 1,2-Dichlorobenzene 1,4-Dichlorobenzene 1,2-Dichloroethane 1,1-Dichloroethylene cis-1,2-Dichloroethylene Dichloromethane 2,4-Dichlorophenoxyacetic acid (2,4-D) 1,2-Dichoropropane Dioxin (2,3,7,8-TCDD) Diquat. Endothall. Epichlorohydrin. Glyphosate.	Heptachlor. Heptachlor Epoxide. Hexachlorobenzene. Hexachlorocyclopentadiene. Lindane. Methoxychlor. Oxamyl (Vydate). Pentachlorophenol. Picloram. Selenium. Simazine. Styrene. Tetrachloroethylene (PCE). Thallium. 1,2,4-Trichlorobenzene. 1,1,1-Trichloroethane. 1,1,2-Trichloroethane. Toluene. Total Coliform. Toxaphene. Trichloroethylene (TCE). Vinyl Chloride. Xylenes.
		Emerging information and/or data gaps.	Cyanide (as free cyanide) Fluoride.	Nitrate. Nitrite.
Candidate for Revision	New information.		None.	

[1] Regulation abbreviations: Aircraft Drinking Water Rule (ADWR), Ground Water Rule (GWR), Revised Total Coliform Rule (RTCR), Surface Water Treatment Rule (SWTR), Interim Enhanced Surface Water Treatment Rule (IE), Long Term 1 Enhanced Surface Water Treatment Rule (LT1), and Long Term 2 Enhanced Surface Water Treatment Rule (LT2).

EPA has identified no appropriate candidates for revision at this time.

EPA's Office of Ground Water and Drinking Water is currently engaged in several ongoing and potential regulatory actions, in addition to being involved in the efforts to successfully implement recently promulgated rules including:

- Developing a proposal to revise the Microbial and Disinfection By-Product Rules, including eight NPDWRs listed as candidates for revision in Six-Year Review 3 (85 FR 61680, USEPA, 2020a).
- On December 6, 2023, EPA published the proposed rule ''National Primary Drinking Water for Lead and Copper: Improvements'' (88 FR 84878, USEPA, 2023a).
- In January 2024, EPA announced its commitment to promulgate a National Primary Drinking Water Regulation for Perchlorate by May 2027.[5]
- On April 26, 2024, EPA published the PFAS final rule ''PFAS National Primary Drinking Water Regulation'' (89 FR 32532, USEPA, 2024a).
- On May 24, 2024, EPA published the final rule ''National Primary Drinking Water Regulations: Consumer Confidence Reports'' (89 FR 45980, USEPA, 2024b).

Therefore, when evaluating the review results described in sections V.B and V.C of this document, EPA also considered competing workloads and potential diversion of resources from these other planned, ongoing, and pending higher priority efforts within the drinking water office.

B. Chemical Phase Rules/Radionuclides Rules

The NPDWRs for chemical contaminants, collectively called the Phase Rules, were promulgated between 1987 and 1992, following the 1986 SDWA amendments. In December 2000, EPA promulgated final radionuclide regulations, which had been issued as interim rules in July 1976.

1. Key Review Outcomes

EPA has decided that it is not appropriate at this time to revise any of the NPDWRs covered under the Phase or Radionuclides Rules (Table 2 of this document). These NPDWRs were determined not to be candidates for revision for one or more of the following reasons:

- ongoing/pending regulatory action warrants waiting for further review;
- no new information was identified to suggest possible changes in MCLG/MCL;
- new information did not present a meaningful opportunity for health risk reduction or cost savings while maintaining/improving public health protection;
- emerging information and/or data gaps create substantial uncertainty.

In addition, EPA is announcing that the NPDWRs for trichloroethylene (TCE) and tetrachloroethylene (PCE) are no longer candidates for revision at this time. In March 2010, as an outcome of the second cycle of Six-Year Review, EPA listed the TCE and PCE NPDWRs as candidates for revision (75 FR 15500, USEPA, 2010a). TCE and PCE were not reviewed under Six-Year Review 3 because regulatory revisions were being considered as part of plans to address regulated and unregulated Carcinogenic Volatile Organic Contaminants (cVOCs) in a group rule (75 FR 3525, January 21, 2010; 82 FR 3531, USEPA, 2017a). However, after evaluating currently available information for both of these chemicals, the EPA concludes that these NPDWRS are not appropriate for revision at this time because minimal reductions in health risks would be associated with any revisions to these regulations. Given resource limitations, competing workload priorities, and administrative costs and burden to states to adopt any regulatory changes associated with rulemakings, as well as limited potential health benefits, these NPDWRs are considered a low priority and are no longer candidates for revision at this time.

Section V.B.2 of this document describes the results of the review organized by each review element. Section V.B.3 of this document includes a description of the new information gathered by EPA for select contaminants that EPA determined are not candidates for revision at this time due to emerging information or data gaps or no meaningful opportunity for health risk reduction. The contaminants discussed in detail in section V.B.3 of this document are cyanide, fluoride, nitrate, nitrite, TCE, and PCE.

Review results organized by contaminant for the Chemical Phase and Radionuclides Rules can be found in the ''Chemical Contaminant Summaries for the Fourth Six-Year Review of National Primary Drinking Water Regulations'' (USEPA, 2024e).

2. Summary of Review Results

Initial Review

After conducting the initial review, as described in section IV.B.1 of this document, EPA identified two chemical contaminants (lead and copper) with NPDWRs that were considered as part of a recently completed action, and which are also currently part of an ongoing or pending regulatory action. EPA published the Lead and Copper Rule Revisions in January 2021 and published the proposed Lead and Copper Rule Improvements on December 6, 2023. EPA did not evaluate lead and copper in Six-Year Review 4 because such effort would be redundant with these recent and ongoing rulemakings. EPA also identified contaminants with ongoing or planned EPA health effects assessments. As of December 31, 2021, nine chemical or radiological contaminants reviewed had ongoing or planned formal EPA health effects assessments. Table 3 of this document below lists the contaminants with ongoing or planned EPA assessments at the time of the Six-Year Review 4 cutoff date and the current status of those reviews. EPA did not conduct a detailed review of these nine chemical and radiological contaminants under Six-Year Review 4.

TABLE 3—SIX-YEAR REVIEW CHEMICAL/RADIOLOGICAL CONTAMINANTS WITH ONGOING OR PLANNED EPA HEALTH ASSESSMENTS

Chemical/radionuclide	Status [1]
Alpha/photon emitters	EPA Office of Air and Radiation (OAR) is conducting a review of alpha and beta photon emitters. Additional information about this effort can be found at in the *Federal Register* (87 FR 15988, USEPA, 2022a) or at: *https://sab.epa.gov/ords/sab/r/sab_apex/sab_bkup/advisoryactivitydetail?p18_id=2616&clear=18&session=8694491614209.*
Arsenic	Inorganic arsenic is being assessed by the EPA IRIS Program. The assessment status can be found at: *https://iris.epa.gov/ChemicalLanding/&substance_nmbr=278.*
Beta/photon emitters	EPA/OAR is conducting a review of alpha and beta photon emitters. Additional information about this effort can be found at in the Federal Register (87 FR 15988, USEPA, 2022a) or at: *https://sab.epa.gov/ords/sab/r/sab_apex/sab_bkup/advisoryactivitydetail?p18_id=2616&clear=18&session=8694491614209.*

[5] Additional information can be found at *https://www.epa.gov/sdwa/perchlorate-drinking-water.*

TABLE 3—SIX-YEAR REVIEW CHEMICAL/RADIOLOGICAL CONTAMINANTS WITH ONGOING OR PLANNED EPA HEALTH ASSESSMENTS—Continued

Chemical/radionuclide	Status [1]
Chromium VI (as part of total Cr).	Chromium VI is being assessed by the EPA IRIS Program. The assessment status can be found at: *https://iris.epa.gov/ChemicalLanding/&substance_nmbr=144.*
Ethylbenzene	Ethylbenzene is being assessed by the EPA IRIS Program. The assessment status can be found at: *https://iris.epa.gov/ChemicalLanding/&substance_nmbr=51.*
Mercury	Inorganic Mercury Salts is being assessed by the EPA IRIS Program. The Assessment status can be found at: *https://iris.epa.gov/ChemicalLanding/&substance_nmbr=1522.*
PCBs	PCBs are being assessed by the EPA IRIS Program. The assessment status can be found at: *https://iris.epa.gov/ChemicalLanding/&substance_nmbr=294.*
Radium 226/228	EPA/OAR is conducting a review of radium. Additional information about this effort can be found at in the FEDERAL REGISTER (87 FR 15988, USEPA, 2022a) or at: *https://sab.epa.gov/ords/sab/r/sab_apex/sab_bkup/advisoryactivitydetail?p18_id=2616&clear=18&session=8694491614209.*
Uranium	Uranium is being assessed by the EPA IRIS Program. The assessment status can be found at: *https://iris.epa.gov/ChemicalLanding/&substance_nmbr=259.*

[1] Additional information on the status of EPA IRIS Program assessments can be found in the EPA IRIS Program Outlooks at *https://www.epa.gov/iris/iris-program-outlook.*

Regarding the ongoing health assessment for Chromium VI (hexavalent chromium), on October 20, 2022 the EPA published its draft ''IRIS Toxicological Review of Hexavalent Chromium [Cr(IV)]'' (87 FR 63774, USEPA, 2022b). This draft health effects assessment, which includes a comprehensive evaluation of potential health effects, preliminarily categorizes hexavalent chromium as likely carcinogenic to humans via the oral exposure pathway. The final IRIS assessment was not available as of the publication of this document and for consideration as part of Six-Year Review 4. When this human health assessment is final, EPA will carefully review the conclusions and consider all relevant information to determine whether the NPDWR for chromium is a candidate for revision.

After the initial review was completed, EPA identified 71 chemical and radiological NPDWRs that were appropriate for detailed review.

Health Effects

The principal objectives of the health effects assessment review were to identify: (1) contaminants for which a new health effects assessment indicates that a change in MCLG might be appropriate (*e.g.,* because of a change in cancer classification or an RfD), and (2) contaminants for which the agency has identified new health effects information suggesting a need to initiate a new health effects assessment. For chemicals that were not excluded due to an ongoing or planned health effects assessment by EPA, a more detailed review was undertaken. Of the chemicals that underwent a more detailed review, EPA identified 29 contaminants for which an updated RfD and/or the cancer risk assessment (from oral exposure) or new relevant non-EPA assessments might support a change to the MCLG. These 29 chemicals were further evaluated as part of the Six-Year Review 4 to determine whether they were candidates for regulatory revision. Table 4 of this document lists the chemicals with available new health effects information and the sources of the relevant new information. As shown in this table, 15 chemical contaminants have information that could support a lower MCLG, and 14 contaminants have new information that could support a higher MCLG.

TABLE 4—CHEMICALS WITH NEW HEALTH ASSESSMENTS THAT COULD SUPPORT A CHANGE IN MCLG

Chemical	Relevant new assessment
15 Contaminants with Potential to Decrease the MCLG	
Antimony	CalEPA, 2016.
Cadmium	ATSDR, 2012.
Carbofuran	USEPA OPP, 2008.
Cyanide	USEPA IRIS, 2010b.
cis-1,2-Dichloroethylene	USEPA IRIS, 2010c.
Endothall	USEPA OPP, 2015b.
Fluoride	USEPA OW, 2010d.
Hexachlorocyclopentadiene	USEPA IRIS, 2001.
Methoxychlor	CalEPA, 2010a.
Oxamyl	USEPA OPP, 2017b.
Selenium	ATSDR, 2003.
Styrene	CalEPA, 2010b.
Toluene	Health Canada, 2014.
1,2,4-Trichlorobenzene	USEPA PPRTV, 2009a.
Xylenes	Health Canada, 2014.
14 Contaminants with Potential to Increase the MCLG	
Alachlor	USEPA OPP, 2007a.
Atrazine	USEPA OPP, 2018a.
Barium	USEPA IRIS, 2005.
Beryllium	USEPA IRIS, 1998.
2,4-Dichlorophenoxy-acetic acid (2,4-D)	USEPA OPP, 2017c.
1,2-Dichlorobenzene	ATSDR, 2006.
1,4-Dichlorobenzene	ATSDR, 2006.

TABLE 4—CHEMICALS WITH NEW HEALTH ASSESSMENTS THAT COULD SUPPORT A CHANGE IN MCLG—Continued

Chemical	Relevant new assessment
1,1-Dichloroethylene	USEPA IRIS, 2002.
Diquat	USEPA OPP, 2020b.
Glyphosate	USEPA OPP, 2017d.
Lindane	USEPA OPP, 2004.
Picloram	USEPA OPP, 2020c.
Simazine	USEPA OPP, 2018b.
1,1,1-Trichloroethane	USEPA IRIS, 2007b.

Details of the health effects assessment review of the chemical and radiological contaminants are documented in the ''Results of the Health Effects Assessment for the Fourth Six-Year Review of Existing Chemical and Radionuclide National Primary Drinking Water Standards'' (USEPA, 2024f).

Analytical Feasibility

EPA performed analytical feasibility analyses for the contaminants that reached this portion of the review. These contaminants included the 15 chemical contaminants identified under the health effects assessment review as having potential for a lower MCLG. EPA evaluated whether there were any analytical limitations to lowering the MCL to the potential MCLG. EPA also evaluated an additional 22 contaminants with MCLs higher than the current MCLGs due to analytical limitations at the time of rule promulgation. The document ''Analytical Feasibility Support Document for the Fourth Six-Year Review of National Primary Drinking Water Regulations: Chemical Phase and Radionuclides Rules'' (USEPA, 2024g) describes the process EPA used to evaluate whether changes in PQL are possible in those instances where the MCL may be limited by analytical feasibility.

Table 5 of this document shows the outcomes of EPA's analytical feasibility review for two general categories of drinking water contaminants: (1) contaminants where health effects assessments indicate potential for lower MCLGs, and (2) contaminants where existing MCLs were limited by analytical feasibility at the time of promulgation and new information indicates a potential to reduce the PQL.

- *A health effects assessment indicates potential for lower MCLG.* This category includes the 15 contaminants identified in the health effects review as having potential for a lower MCLG. EPA reviewed the available information to determine if analytical feasibility could limit the potential for MCL revisions. The current PQL is not a limiting factor for seven of the 15 contaminants identified by the health effects review as potential candidates for lower MCLGs (cis-1,2-dichloroethylene, fluoride, hexachlorocyclopentadiene, oxamyl, selenium, toluene, and xylenes). For the remaining eight contaminants, the current PQL is higher than the potential new MCLG, so EPA evaluated whether there is an opportunity to lower the PQL. The evaluations indicated that all but one contaminant (antimony) have potential for a lower PQL, although not to the potential MCLG. Consequently, analytical feasibility may limit potential MCL revisions for the remaining seven contaminants (Table 5 of this document).

- *Existing MCLs are based on analytical feasibility.* This category includes 22 contaminants with existing MCLs that are greater than the associated MCLGs due to analytical constraints at the time of rule promulgation. Two of the contaminants (thallium and 1,1,2-trichloroethane) are non-carcinogenic and have a non-zero MCLG, and the remaining 20 contaminants are carcinogens with MCLGs equal to zero. EPA evaluated whether the PQL could be lowered for each of these contaminants. The evaluations indicated that all but five (benzo[a]pyrene, DBCP, DEHP, ethylene dibromide, PCBs) of the 22 contaminants evaluated have potential for a lower PQL (Table 5 of this document).

Where analytical feasibility evaluations indicated the potential for a PQL reduction, Table 5 of this document lists the type of data that support this conclusion. The types of data considered include laboratory proficiency tests (PT), method detection limits (MDL) from EPA-approved methods, and minimum reporting level (MRL) from the SYR 4 ICR dataset. The methods to evaluate each of these data types to identify potential to reduce PQLs are described in the analytical feasibility support document (USEPA, 2024g). Where the evaluations indicated that the current PQL remained appropriate, Table 5 shows of this document ''Data do not support PQL reduction.'' EPA found information supporting potentially lower MCLs for 31 out of 37 contaminants evaluated.

TABLE 5—ANALYTICAL FEASIBILITY REASSESSMENT RESULTS

Contaminant	Current PQL (µg/L)	Analytical feasibility reassessment result (and source of new information) [1]
15 Contaminants Identified Under the Health Effects Review as Having Potential for Lower MCLG		
Antimony	6	Data do not support PQL reduction.
Cadmium	2	PQL reduction supported (MDL, MRL).
Carbofuran	7	PQL reduction supported (MDL).
Cis-1,2-dichloroethylene	5	PQL not limiting.
Cyanide	100	PQL reduction supported (MDL).
Endothall	90	PQL reduction supported (MDL, MRL).
Fluoride	500	PQL not limiting.
Hexachlorocyclopentadiene	1	PQL not limiting.
Methoxychlor	10	PQL reduction supported (MDL, MRL, PT).
Oxamyl	20	PQL not limiting.
Selenium	10	PQL not limiting.
Styrene	5	PQL reduction supported (MDL, MRL, PT).
Toluene	5	PQL not limiting.
Xylenes	5	PQL not limiting.
1,2,4-Trichlorobenzene	5	PQL reduction supported (MDL, MRL, PT).
22 Contaminants with MCLs Limited by Analytical Feasibility and Higher than MCLGs		
Benzene	5	PQL reduction supported (MDL, MRL, PT).
Benzo[a]pyrene	0.2	Data do not support PQL reduction.
Carbon tetrachloride	5	PQL reduction supported (MDL, MRL, PT).
Chlordane	2	PQL reduction supported (MDL).
1,2-Dibromo-3-chloropropane (DBCP)	0.2	Data do not support PQL reduction.
1,2-Dichloroethane	5	PQL reduction supported (MDL, MRL, PT).
Dichloromethane	5	PQL reduction supported (MDL, MRL, PT).
1,2-Dichloropropane	5	PQL reduction supported (MDL, MRL, PT).
Di(2-ethylhexyl)phthalate (DEHP)	5	Data do not support PQL reduction.
Ethylene dibromide	0.05	Data do not support PQL reduction.
Heptachlor	0.4	PQL reduction supported (MDL).
Heptachlor epoxide	0.2	PQL reduction supported (MDL).
Hexachlorobenzene	1	PQL reduction supported (MDL, MRL).
Pentachlorophenol	1	PQL reduction supported (MDL).
PCBs	0.5	Data do not support PQL reduction.
2,3,7,8-TCDD (dioxin)	0.00003	PQL reduction supported (MRL).
Tetrachloroethylene	5	PQL reduction supported (MDL, MRL).
Thallium	2	PQL reduction supported (MRL).
Toxaphene	3	PQL reduction supported (MRL, PT).
1,1,2-Trichloroethane	5	PQL reduction supported (MDL, MRL, PT).
Trichloroethylene	5	PQL reduction supported (MDL, MRL, PT).
Vinyl chloride	2	PQL reduction supported (MDL, MRL, PT).

[1] The information source codes refer to the method detection limit (MDL), minimum reporting level (MRL), and proficiency testing (PT) data analyses. See USEPA (2024g) for further information.

Occurrence and Exposure

Using the SYR 4 ICR database, EPA conducted an assessment to evaluate national occurrence of regulated contaminants and estimate the potential population exposed to these contaminants. The details of the current chemical occurrence analysis are documented in the ''Analysis of Regulated Contaminant Occurrence Data from Public Water Systems in Support of the Fourth Six-Year Review of National Primary Drinking Water Regulations: Chemical Phase Rules and Radionuclides Rules'' (USEPA, 2024h). Based on quantitative benchmarks which were identified in the health effects and analytical feasibility analyses, EPA conducted the occurrence and exposure analysis for 31 contaminants.

This analysis shows that 27 of the 31 contaminants assessed rarely occur at levels above the identified benchmark (*e.g.,* potential MCLG or PQL). For these 27 contaminants, monitoring results only exceeded benchmarks in a very small percentage (*i.e.,* less than 0.5 percent) of systems, which serve a very small percentage of the population, indicating that revisions to NPDWRs are unlikely to provide a meaningful opportunity to improve public health protection at the national level. Therefore, these 27 contaminants were not further considered as candidates for regulatory revision. The other four contaminants (cyanide, fluoride, TCE, and PCE) occurred at rates ranging from 0.57 to 9.1 percent of systems within the SYR 4 ICR dataset and 3.4 to 6.3 percent of the population served by those systems. Additional considerations for cyanide, fluoride, TCE, and PCE are discussed in section V.B.3 of this document. Table 6 of this document lists the numerical benchmarks used to conduct the occurrence analysis, the total number of systems with mean concentrations exceeding a benchmark, and the estimated population served by those systems. These average concentration-based evaluations are intended to inform the Six-Year Review, not to assess compliance with regulatory standards.

TABLE 6—OCCURRENCE AND POTENTIAL EXPOSURE ANALYSIS FOR CHEMICAL NPDWRS

Contaminant	Current MCL (ug/L)	Benchmark [1] (ug/L)	Number (and percentage) of systems with a mean concentration [2] higher than benchmark	Population served by systems with a mean concentration higher than benchmark (and percentage of total population)
Contaminants Identified Under the Health Effects Review as Having Potential for Lower MCLG				
Cadmium	5	1	182 (0.36%)	430,823 (0.16%)
Carbofuran	40	5	[3] 7 (0.02%)	[3] 49,409 (0.02%)
Cyanide	200	50	328 (0.85%)	8,134,220 (3.43%)
cis-1,2-Dichloroethylene	70	10	7 (0.01%)	42,215 (0.02%)
Endothall	100	50	0	0
Fluoride [4]	4,000	900	4,479 (9.05%)	17,058,830 (6.30%)
Hexachlorocyclopentadiene	50	40	0	0
Methoxychlor	40	1	1 (<0.01%)	22,536 (0.01%)
Oxamyl	200	9	[3] 7 (0.02%)	[3] 52,677 (0.02%)
Selenium	50	30	91 (0.18%)	84,988 (0.03%)
Styrene	100	0.5	89 (0.17%)	27,473 (0.01%)
Toluene	1,000	60	14 (0.03%)	5,256 (<0.01%)
1,2,4-Trichlorobenzene	70	0.5	15 (0.03%)	126,201 (0.05%)
Xylenes (total)	10,000	80	23 (0.05%)	34,728 (0.01%)
Contaminants with MCLs Higher than MCLGs (Limited by Analytical Feasibility)				
Benzene	5	0.5	83 (0.16%)	319,633 (0.12%)
Carbon tetrachloride	5	0.5	90 (0.17%)	766,891 (0.28%)
Chlordane	2	1	1 (<0.01%)	240 (<0.01%)
1,2-Dichloroethane	5	0.5	60 (0.11%)	181,041 (0.07%)
Dichloromethane	5	0.5	215 (0.41%)	360,289 (0.13%)
1,2-Dichloropropane	5	0.5	41 (0.08%)	34,800 (0.01%)
Heptachlor	0.4	0.1	1 (<0.01%)	900 (<0.01%)
Heptachlor epoxide	0.2	0.1	3 (0.01%)	32,710 (0.01%)
Hexachlorobenzene	1	0.1	6 (0.02%)	17,278 (0.01%)
Pentachlorophenol	1	0.9	0	0
2,3,7,8-TCDD (dioxin)	0.00003	0.000005	7 (0.11%)	2,311 (<0.01%)
Tetrachloroethylene (PCE)	5	0.5	432 (0.83%)	15,811,810 (5.76%)
Thallium	2	1	71 (0.14%)	57,541 (0.02%)
Toxaphene	3	1	2 (0.01%)	335 (<0.01%)
1,1,2-Trichloroethane	5	3	2 (<0.01%)	50 (<0.01%)
Trichloroethylene (TCE)	5	0.5	297 (0.57%)	12,755,926 (4.65%)
Vinyl chloride	2	0.5	24 (0.05%)	307,275 (0.11%)

[1] Benchmark screening levels were set to either potential maximum contaminant level goals (MCLGs) or estimated quantitation levels (EQLs), depending on the contaminant. For more information see USEPA (2024g).

[2] Results are based on long-term means generated by substituting one-half the MRL for each non-detection record. For results based on substituting the value of the full MRL or zero see USEPA (2024h).

[3] Oxamyl and carbofuran have health endpoints associated with acute exposure and are not appropriate for long-term mean estimates. Results show the number of systems with at least one detection exceeding the benchmark.

[4] Estimates represent naturally occurring fluoride concentrations. Quality assurance steps were taken to exclude samples from fluoridated water systems. See USEPA (2024i) for details.

In addition, EPA performed a source water occurrence analysis for the 15 chemical contaminants in which updated health effects assessments indicated the possibility to increase (*i.e.,* render less stringent) the MCLG values. EPA conducted this analysis to assess for meaningful opportunity to achieve cost savings while maintaining or improving the level of public health protection. The data available to characterize contaminant occurrence was limited because a comprehensive dataset to characterize drinking water source quality is not available. Data from the U.S. Geological Survey (USGS) National Water Quality Assessment program and the U.S. Department of Agriculture Pesticide Data Program water monitoring survey provide useful insights into potential contaminant occurrence in source water. The analysis of the available contaminant occurrence data for potential drinking water sources indicated relatively low contaminant occurrence in the concentration ranges of interest, and consequently, no meaningful opportunity for system cost savings by increasing the MCLG and MCL for these 15 contaminants. The results of this analysis were documented in ''Occurrence Analysis for Potential Source Waters for the Fourth Six-Year Review of National Primary Drinking Water Regulations'' (USEPA, 2024j).

Treatment Feasibility

Currently, all of the MCLs for chemical and radiological contaminants are either (1) set equal to the MCLGs, (2) limited by analytical feasibility, or (3) set at the level at which health risk reduction benefits were maximized at a cost justified by the benefits; none are currently limited by treatment feasibility. EPA considers treatment feasibility after identifying contaminants with the potential to lower the MCLG/MCL that constitute a meaningful opportunity to improve public health. No such contaminants were identified in the occurrence and exposure analysis described above.

Treatment techniques were promulgated for two of the chemical and radiological contaminants that were subject to a detailed review in Six-Year Review 4. Acrylamide and epichlorohydrin occur in drinking water as treatment impurities and are primarily introduced as residuals in polymers and copolymers used for water treatment. There are no standardized analytical methods for their measurement in water; instead of sampling, water systems must certify to the State in writing that they use products meeting the specifications in the NPDWR. To evaluate the potential to revise the NPDWRs for these contaminants, EPA obtained data from

NSF on analyses for approval of products against NSF/ANSI Standard 60, which are based on EPA's regulation. NSF certification data shows that manufactured products contain acrylamide and epichlorohydrin impurity levels far below the current regulatory standard. Specifically, the mean residual acrylamide concentration of certified products is one-fifth of the current regulatory level and the 90th percentile is one-half. There were no samples with detections of residual epichlorohydrin. The available data indicates that the majority of tested products already pose lower health risks than required under the current TT, and therefore, revisions are a low priority. EPA is not listing acrylamide and epichlorohydrin as candidates for revision at this time. See USEPA (2024k) for details.

Other Regulatory Revisions

In addition to possible revisions to MCLGs, MCLs, and TTs, as a part of the Six-Year Review 4, EPA considered whether other regulatory revisions to NPDWRs are needed to address implementation issues, such as revisions to monitoring and system reporting requirements. EPA used the protocol to evaluate which implementation issues to consider (USEPA, 2024c). EPA's protocol focused on items that were not already being addressed, or had not yet been addressed, through alternative mechanisms (*e.g.,* as a part of a recent or ongoing rulemaking).

EPA compiled information on implementation-related issues associated with the Chemical Phase Rules. EPA also identified unresolved implementation issues and concerns from previous Six-Year Reviews. The complete list of implementation issues related to the Phase and Radionuclides Rules is presented in ''Consideration of Other Regulatory Revisions in Support of the Fourth Six-Year Review of the National Primary Drinking Water Regulations: Chemical Phase Rules and Radionuclides Rules'' (USEPA, 2024l).

The agency focused on the following five implementation issues in the Six-Year Review 4:

- Use of an alternative MCL for nitrate in Noncommunity Water Systems (NCWSs)
- Frequency of nitrate monitoring in Transient Noncommunity Water Systems (TNCWS)
- Frequency of nitrite monitoring
- Total nitrate-nitrogen plus nitrite-nitrogen MCL
- Total cyanide screening for free cyanide

Table 7 of this document provides a brief description of the five issues and identified potential ways of addressing them. Please see section V.B.3. of this document for a discussion of these contaminants and their review outcomes. Please see USEPA (2024l) for a more detailed description and estimated scope of these issues.

TABLE 7—CHEMICAL RULE IMPLEMENTATION ISSUES IDENTIFIED THAT FALL WITHIN THE SCOPE OF AN NPDWR REVIEW

Implementation issue	Description of issue
Nitrate Alternative MCL in Non-community Water Systems.	EPA evaluated the possibility of removing or further restricting the options for some NCWSs to use an alternative nitrate-nitrogen MCL of up to 20 mg/L. The nitrate-nitrogen MCL specified for PWSs in 40 CFR 141.62 is 10 mg/L and is based on the critical health endpoint of methemoglobinemia in children under six months of age. 40 CFR 141.11 provides States the discretion to use an alternative MCL of 20 mg/L for non-community water systems (NCWS). This alternative MCL is allowed under certain conditions—including that water would be unavailable to children under six months of age. Monitoring requirements for nitrate-nitrogen are specified in the introductory text to 40 CFR 141.23, which states that ''Non-transient, non-community water systems shall conduct monitoring to determine compliance with the maximum contaminant levels specified in § 141.62 in accordance with this section. Transient, non-community water systems (TNCWS) shall conduct monitoring to determine compliance with the nitrate and nitrite MCL in §§ 141.11 and 141.62 (as appropriate) in accordance with this section.'' Potential concerns with the current rule provisions were identified as: • The alternative MCL does not address any nitrate-induced health concerns beyond methemoglobinemia and • While § 141.11 allows the use of the alternative MCL by all eligible NCWS, § 141.23 implies that only TNCWS, a subcategory of NCWS, are eligible to use the alternative MCL. To determine the scope of this issue, the agency reviewed state drinking water regulations and analyzed SYR 4 ICR nitrate compliance data and identified nominal application of the alternative nitrate MCL by NCWSs. In addition, the nitrate and nitrite human health assessments are currently being evaluated by the EPA IRIS program. An updated assessment could inform the potential health effects of nitrate exposure to levels between 10 and 20 mg/L on adult populations. EPA will consider all available and updated human health assessments as it conducts future cycles of the six-year review.
Nitrate Monitoring Frequency in Transient Noncommunity Water Systems.	Currently, community water systems (CWSs) and NTNCWSs are required to monitor for nitrate quarterly if a sample is greater than or equal to 50 percent of the nitrate MCL (§ 141.23). TNCWSs are required to monitor for nitrate annually (§ 141.23(d)(4)). In the preamble to the 1991 final Phase II rule, the agency describes TNCWSs as being subject to the quarterly monitoring requirement stating that ''EPA has decided to retain the 50 percent trigger for increased nitrate monitoring in the case of nitrate and also to extend this requirement to TWSs'' (56 FR 3566, USEPA, 1991). EPA notes the conflict between the regulatory text and the preamble. To evaluate whether it may be appropriate to revise the nitrate NPDWR, the agency analyzed compliance monitoring data collected under the SYR 4 ICR. EPA found that while the majority of TNCWSs that reported detections equal or greater than 50 percent of the nitrate MCL did not conduct quarterly monitoring afterward, the number of these systems appears relatively small. Due to the limited scope of this issue, EPA is not revising the monitoring requirements at this time but will consider monitoring requirements if NPDWRs are revised in the future.

TABLE 7—CHEMICAL RULE IMPLEMENTATION ISSUES IDENTIFIED THAT FALL WITHIN THE SCOPE OF AN NPDWR REVIEW—Continued

Implementation issue	Description of issue
Nitrite Monitoring Frequency	According to 40 CFR 141.23(e)(1), all PWSs were required to monitor for nitrite once between January 1, 1993, and December 31, 1995. If this initial sample was less than 50 percent of the MCL (10 mg/L), systems ''shall monitor at the frequency specified by the State''. Though the nitrite monitoring frequency is not explicitly stated in the CFR, EPA's guidance provides that this frequency should be at least once every 9-year compliance cycle (USEPA, 2020d). EPA is aware that some States may not require systems to conduct routine nitrite monitoring when sample results are less than 50 percent of the MCL. Because sample results below the MCL are not reported to EPA, the scope of this issue is uncertain. To address this uncertainty, EPA analyzed State regulations and nitrite compliance monitoring data to characterize the frequency of nitrite monitoring. Results indicated that a majority of systems monitored for nitrite at least once during the last 9-year compliance cycle (2011–2019). EPA intends to work with States to encourage more systems to sample for nitrite at least once during each 9-year compliance cycle.
Total Nitrate and Nitrite Analysis for Nitrate MCL Monitoring.	In 40 CFR 141.62, the MCL for nitrate is specified as 10 mg/L and the MCL for total nitrate and nitrite is also specified as 10 mg/L. Sampling and analytical requirements as specified in 40 CFR 141.23, however, only included nitrate and left total nitrate and nitrite monitoring up to the discretion of States. Using Safe Drinking Water Information System (SDWIS) compliance data, EPA is aware that at least half of the States allow total nitrate/nitrite analysis to determine compliance with the nitrate MCL. To characterize monitoring practices for the nitrate MCL, the Agency analyzed Six-Year Review 4 compliance monitoring data for both nitrate and total nitrate/nitrite. This evaluation aims to serve as a baseline to assess nitrate monitoring practices in the future, in response to the 2020 EPA guidance outlining best practices when using total nitrate/nitrite analysis for monitoring compliance with the nitrate MCL. EPA is not revising the monitoring requirements at this time but will consider monitoring requirements in § 141.23 if NPDWRs are revised in the future, to incorporate best practices similar to those described in recent guidance (USEPA, 2020e).

3. Select NPDWRs With New Information Not Appropriate for Revision

The NPDWRs discussed in this section had new information identified, but EPA has determined they are not appropriate for revision at this time due to: (1) data gaps or emerging information that are necessary for EPA to evaluate as part of a review or; (2) new information that suggests low or no meaningful opportunity to provide greater public health protection. Examples of data gaps and emerging information identified during the review include an analytical monitoring challenge, a compliance reporting limitation, and an anticipated health effects assessment being developed by another U.S. Federal Agency. Specific details about the data gaps and emerging information identified during the review for on cyanide, fluoride, nitrate, nitrite, TCE, and PCE are provided below.

Cyanide

EPA published the current MCL and MCLG of 0.2 mg/L (200 µg/L) for free cyanide on July 17, 1992 (57 FR 31776, USEPA, 1992). In 2010, EPA published an IRIS assessment (USEPA, 2010b), which identified a new reproductive health effect endpoint that supports decreasing the MCLG from 200 µg/L to 4 µg/L. Analytical feasibility information identified in Six-Year Review 3 and Six-Year Review 4 supports a PQL reduction to as low as 50 µg/L. In Six-Year Review 3, cyanide was listed as ''low priority'' due to low occurrence at levels below the current MCL. Analysis of Six-Year Review 4 occurrence data identified greater occurrence with 328 systems serving 8.1 million people with mean concentrations above 50 µg/L (see Table 6 of this document). However, occurrence was limited to few states (USEPA, 2024h). EPA considered these occurrence results and the potential for a meaningful opportunity to improve the level of public health protection.

Two analytical monitoring challenges complicate interpretation of the occurrence data. As described in section V.B.2 of this document, an analytical artifact created by ascorbic acid pretreatment of drinking water samples, which had been disinfected with chloramines, can result in false positives for free cyanide (USEPA, 2020f). An EPA guidance document (USEPA, 2020f) identified solutions to address this analytical challenge, but the general awareness of the availability of this guidance is uncertain. Second, EPA is aware that some systems analyze samples for total cyanide, and if the results are lower than the MCL, these systems report the total cyanide results as free cyanide. Systems may achieve cost savings by analyzing samples for total cyanide; however, using results for total cyanide instead of free cyanide could potentially overestimate the actual occurrence of free cyanide. Free and total cyanide results cannot be distinguished in the Six-Year Review 4 ICR dataset because the Safe Drinking Water Information System (SDWIS) State-version that many primacy agencies use to manage SDWA compliance monitoring data does not have an analyte code for total cyanide. Because the numerical benchmark used for occurrence is significantly lower than the current cyanide MCL, some of the reported concentrations may be for total cyanide. Therefore, the Six-Year Review 4 occurrence analysis likely overestimates free cyanide occurrence. For these reasons, EPA does not believe it is appropriate to list the cyanide NPDWR as a candidate for revision at this time. EPA intends to help address these data gaps by continuing to disseminate the 2020 guidance on analytical methods for cyanide and may consider an additional analyte code for total cyanide in the SDWIS reporting system. Further discussion of the cyanide monitoring issues can be found in USEPA (2024h).

Fluoride

EPA published the MCL and MCLG of 4.0 mg/L for fluoride on April 2, 1986 (51 FR 11396, USEPA, 1986) based on the critical health endpoint of crippling skeletal fluorosis. EPA also established a secondary MCL/MCLG at 2.0 mg/L to protect against cosmetically objectionable dental fluorosis

(discoloration and/or pitting of teeth). Certain drinking water systems may choose to fluoridate finished water as a public health protection measure for reducing the incidence of cavities. The U.S. Public Health Service (PHS) recommendation for the optimal community water fluoridation level is 0.7 mg/L (U.S. Department of Health and Human Services, 2015). The decision to fluoridate a community water supply is made by the state or local municipalities and is not required by EPA or any other federal entity. Fluoride is also added to various consumer products, such as toothpaste and mouthwash.

EPA has reviewed the NPDWR for fluoride in prior Six-Year Reviews. As a result of Six-Year Review 1, EPA requested that the National Research Council (NRC) of the National Academies of Sciences (NAS) conduct a review of the health and exposure data on orally ingested fluoride. In 2006, the NRC published the results of its review and concluded that severe dental fluorosis can be an adverse health effect (NRC, 2006). The NRC report recommended that EPA develop a dose-response assessment for severe dental fluorosis as the critical health endpoint and update an assessment of fluoride exposure from all sources.

In 2010, EPA published Dose Response Analysis for Noncancer Effects (USEPA, 2010d), which was considered under Six-Year Review 3. For more information, please see Appendix C of the Six-Year Review 3 Health Effects Assessment for Existing Chemical and Radionuclide National Primary Drinking Water Regulations—Summary Report (USEPA, 2016). In Six-Year Review 3, EPA did not recommend the fluoride NPDWR for revisions citing limited agency resources, prioritization of other contaminants, ongoing health effects research, and other factors that were anticipated to reduce the U.S. population's exposure to fluoride via drinking water (82 FR 3531, USEPA, 2017a). In Six-Year Review 4, EPA again considered the 2010 EPA assessment to derive a lower potential MCLG of 0.9 mg/L. Review results are provided in section V.B.2. of this document.

Available published literature on other health effect categories including neurotoxicity and behavior, reproduction and development, endocrine effects, and cancer were reviewed in the EPA assessment (USEPA, 2010d). However, based on the review of the available literature at the time, EPA determined that the data for these other health effects associated with fluoride exposure were insufficient to support their selection as critical effects for potential MCLG derivation (USEPA, 2010d). EPA is aware of ongoing efforts by the National Toxicology Program (NTP) to conduct a systematic review and meta-analysis of the published literature on developmental neurotoxicity for fluoride. In May 2023, NTP released the Draft ''NTP Monograph on the State of the Science Concerning Fluoride Exposure and Neurodevelopmental and Cognitive Health Effects: A Systematic Review'' (NTP, 2023); however, the NTP systematic review and meta-analysis are not health assessments that could be used to directly inform the derivation of a potential MCLG. Due to emerging research published on developmental neurotoxicity after fluoride exposure coupled with competing workloads and other ongoing high priority actions (see section V.A of this document.), EPA has decided that the fluoride NPDWR is not a candidate for revision at this time. In addition, the NTP has not made a final decision about the report's developmental neurotoxicity systematic review conclusions and has not formally released a final report. Following publication of the final NTP report, EPA will consider the systematic review and meta-analysis conclusions regarding developmental neurotoxicity to inform the agency's future development of a health effects assessment for fluoride. See USEPA (2024f) Appendix B for more information.

Nitrate and Nitrite

EPA published the MCLs and MCLGs for nitrate (10 mg/L) and nitrite (1 mg/L) based on the critical endpoint of methemoglobinemia (blue baby syndrome) on January 30, 1991 (56 FR 3526, USEPA, 1991). Nitrate and nitrite were not reviewed in detail under Six-Year Review 3 due to ongoing IRIS assessments at that time. Although the development of the IRIS assessment for nitrate and nitrite was suspended in December 2018, EPA has restarted development of their health assessment for nitrate and nitrite as indicated in the October 2023 IRIS Program Outlook. The agency recently released the ''Protocol for the Nitrate and Nitrite IRIS Assessment (Oral)'' for public comment on November 9, 2023 (88 FR 77310, USEPA, 2023b). EPA plans to evaluate whether a revision of the nitrate and nitrite NPDWRs is appropriate, once the final IRIS assessment is available.

Trichloroethylene (TCE) and Tetrachloroethylene (PCE)

The NPDWR for TCE was published on July 8, 1987 (52 FR 25690, USEPA, 1987) and the NPDWR for PCE was published on January 30, 1991 (56 FR 3526, USEPA, 1991). Both TCE and PCE are classified as carcinogens and have MCLGs and MCLs of zero and 5 µg/L, respectively. The MCLs were based on analytical feasibility at the time of rule promulgation. TCE and PCE were both listed as candidates for revision in Six-Year Review 2, based on updated analytical feasibility, treatment, and occurrence information.

In 2011, EPA announced plans to address a group of regulated and unregulated carcinogenic volatile organic contaminants (cVOCs) in a single regulatory effort. The eight regulated contaminants that were evaluated for the cVOCs group regulation included benzene, carbon tetrachloride, 1,2-dichloroethane, 1,2-dichloropropane, dichloromethane, PCE, TCE, and vinyl chloride. In Six-Year Review 3, these contaminants were categorized under recent, ongoing, or planned regulatory action and were not reviewed. The cVOC group regulation was not promulgated, as a result these eight contaminants were reviewed again during Six-Year Review 4. EPA has determined that TCE and PCE are no longer candidates for revision at this time based on updated information.

In Six-Year Review 2, EPA assessed analytical information that supported reducing the PQL and evaluated occurrence for TCE and PCE at 0.5 µg/L. As shown in Tables 5 and 6 of this document, EPA identified information in Six-Year Review 4 that again supported assessing occurrence at that level. The average TCE concentration exceeded 0.5 µg/L in 297 systems, representing 0.57 percent of the systems assessed nationwide and serving approximately 13 million people. Similarly, the average PCE concentration exceeded 0.5 µg/L in 432 systems, which represent 0.83 percent of the approximately 50,000 PWSs assessed nationwide and serve approximately 16 million people. These occurrence results are consistent with the Six-Year Review 2 estimates (75 FR 15500, March 29, 2010, USEPA, 2010a).

The most recent final IRIS assessments for TCE (USEPA, 2011) and PCE (USEPA, 2012) were completed after the Six-Year Review 2 results were published and have been selected as the health assessments relevant to chronic toxicity for TCE and PCE in Six-Year Review 4 (USEPA, 2024f). The updated IRIS assessments maintained the classification of ''carcinogenic to humans,'' and therefore do not support a change to the MCLGs of zero for either TCE or PCE. Based on the Six-Year Review 4 occurrence estimates described above, EPA considered if there was a potential for an increase in

human health protection at the lower identified level. To evaluate this potential, EPA examined the cancer risk level associated with the current MCLs (5 µg/L) and the screening level (0.5 µg/L) using updated occurrence and health effects information from Six-Year Review 4. The cancer risk levels at the current MCLs for TCE and PCE are 1×10^{-5} (USEPA, 2011) and 3.0×10^{-7} (USEPA, 2012), respectively. These cancer risk levels correspond to excess lifetime cancer cases of 10 and 0.3 cases per million people, respectively. At the screening level of 0.5 µg/L, the risk per million people would be 1 case for TCE and 0.03 cases for PCE. The implied number of baseline cancer cases over a 70-year exposure period is unlikely to exceed 120 total cases for TCE and 5 total cases for PCE. This corresponds to annual averages of 1.7 and 0.07 cases for TCE and PCE, respectively. This new information identified since Six-Year Review 2 indicates that revising the MCLs for either TCE or PCE would result in relatively small health risk reductions among the exposed population and would divert significant resources from other planned and ongoing work. Therefore, EPA has determined that TCE and PCE are considered ''low priority'' and are no longer candidates for revision.

C. Microbial Contaminants Regulations

As discussed in section III of this document, the initial review branch of the review protocol identifies NPDWRs that have recently been recently competed or are being reviewed in ongoing or pending regulatory actions. Excluding such contaminants from a more detailed review in the Six-Year Review 4 prevents duplicative Agency efforts. Based on the initial review and considering the ongoing rulemaking activities for the Microbial and Disinfection Byproduct Rules, EPA did not perform a more detailed review for the Surface Water Treatment Rule (SWTR), the Interim Enhanced Surface Water Treatment Rule (IESWTR), the Long-Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR), and the Stage 1 and Stage 2 Disinfectants and Disinfection Byproducts Rules. The following microbial contaminant regulations were subject to a more detailed review for the Six-Year Review 4:

- Revised Total Coliform Rule (RTCR)
- Long Term 2 Enhanced Surface Water Treatment Rule (LT2)
- Ground Water Rule (GWR)
- Aircraft Drinking Water Rule (ADWR)
- Filter Backwash Recycling Rule (FBRR)

Background information on each of the microbial contaminant regulations is presented in the subsequent sections. EPA is conducting its first detailed review of the RTCR and the ADWR as part of the Six-Year Review. The RTCR and the ADWR were excluded from a detailed review in Six Year Review 3 because they were promulgated in 2013 and 2009, respectively.

These microbial contaminants regulations establish treatment technique (TT) requirements in lieu of MCLs, except in the RTCR, EPA also established an MCL for Escherichia coli (*E. coli*) and TT requirements for total coliform. In accordance with the Six-Year Review Protocol, during the six-year review process, EPA assesses whether new health risk, analytical methods, or treatment information indicate possible TT revision. For the RTCR, the regulatory review determines whether new information indicates potential revision to the MCL for *E. coli.*

The elements of the RTCR, LT2, GWR, and ADWR regulations that were reviewed for Six-Year Review 4 were: health effects, analytical feasibility, occurrence and exposure, and treatment feasibility. For the RTCR, LT2, GWR, and ADWR regulations, the EPA did not find any new relevant information as it relates to analytical feasibility. For all the other elements reviewed a summary of the findings is included in the subsequent sections. In addition, detailed information about the review is provided in the ''Six-Year Review 4 Technical Support Document for Microbial Contaminant Regulations'' (USEPA, 2024m).

At this time, none of the reviewed microbial contaminant rules are being identified as a candidate for regulatory revision.

1. Revised Total Coliform Rule

Background

EPA promulgated the Revised Total Coliform Rule (RTCR), a revision to the Total Coliform Rule, on February 13, 2013 (78 FR 10269, USEPA, 2013). The Total Coliform Rule (TCR) was promulgated on June 29, 1989 (54 FR 27544, USEPA, 1989). The purpose of the revision was to increase public health protection through the reduction of potential entry pathways for fecal contamination into distribution systems. The TCR required all public water systems (PWSs) to monitor for the presence of total coliforms and Escherichia coli (*E. coli*)) in the distribution system at a frequency dependent on the size (population served by) of the system. Under the TCR, a maximum contaminant level (MCL) was established based on the presence or absence of total coliforms with the intent to address contamination that could enter into distribution systems. The RTCR revised the TCR to eliminate the MCL for total coliforms and established an MCLG and MCL for *E. coli* of zero. The RTCR also requires PWSs that have an indication of coliform contamination (*e.g.,* as a result of total coliform positive samples, *E. coli* MCL violations or performance failure) to find and assess the problem, identify sanitary defects and take corrective action. There are two levels of assessments (*i.e.,* Level 1 and Level 2) based on the severity or frequency of the problem.

Summary of Review Results

Information available for national occurrence and exposure indicates that both routine total coliform and *E. coli* positive rates have decreased after the implementation of RTCR. EPA concludes that no regulatory revisions to the RTCR are appropriate at this time based on the review of available information.

Health Effects

Collier et al. (2021) estimated the collective U.S. disease burden attributable to over a dozen waterborne illnesses from infectious pathogens found in the distribution system (vibriosis, campylobacteriosis, cryptosporidiosis, giardiasis, Legionnaire's disease, salmonellosis, shigellosis, infections by non-tuberculous mycobacteria (NTM), norovirus, Shiga-toxin-producing *E. coli,* otitis externa, pneumonia, and septicemia). These researchers estimated the total disease burden at approximately 7.15 million cases annually, with an estimated 118,000 hospitalizations and 6,630 deaths. In this analysis, waterborne disease is understood to include gastrointestinal, respiratory, and systemic disease attributable to both drinking-water and non-drinking-water exposure. From further evaluation of this study's cases, Gerdes et al. (2023) determined 1.13 million of these illnesses were attributable to drinking water. According to the estimates presented in these studies, the opportunistic pathogens (*Legionella,* Nontuberculous Mycobacteria (NTM), and *Pseudomonas*) impose a greater public health burden than the fecal pathogens. Of the estimated 7.15 million infectious waterborne illnesses in 2014 in the United States, drinking water exposure caused 40 percent of hospitalizations and 50 percent of deaths.

Occurrence and Exposure

To evaluate potential pathogenic contamination in distribution systems EPA analyzed national compliance monitoring data from the SYR 4 ICR dataset (USEPA, 2019. EPA assessed the trends that may be associated with the implementation of the RTCR and found a statistically significant decline for total coliform positive results from years of 2014–2015 to 2018–2019 (*i.e.,* before and after the implementation of RTCR respectively). The result suggests that the presence of these indicator organisms in the distribution system was declining. The trend of declining positive total coliform results was observed across different types of public water systems, water sources (ground water versus surface water), and system sizes (small versus large). With respect to the fecal contamination indicator *E. coli,* the observed decreasing trend was not supported by a statistical test of significance. EPA also found that the absolute number of *E. coli* positives were low, suggesting that the treatment techniques are effective (USEPA, 2024m).

Treatment Feasibility

In this section as part of Six-Year Review process, EPA evaluated new information about tools and treatment techniques. Since the major treatment technique requirements under the RTCR are assessments followed by corrective actions (if total coliform and/or *E. coli* are detected), EPA evaluated the effectiveness of such requirements by comparing total coliform and *E. coli* positive rates after completion of either Level 1 or Level 2 assessments (USEPA, 2024m).

EPA found about an 80 percent decrease in both routine total coliform and *E. coli* positive rates, two months after completion of RTCR assessments for systems having a monthly monitoring schedule.

These analytical results and newly compiled information suggest that the ''find and fix'' approach prescribed under the provisions of assessments and corrective action within RTCR appears to work as intended for reducing the microbial occurrence in distribution systems and may be improving public health protection from microbial risks (as indicated by a substantial drop of the total coliform and *E. coli* positive rates following completion of corrective actions to respond to assessments).

2. Long Term 2 Enhanced Surface Water Treatment Rule

Background

EPA promulgated the Long Term 2 Enhanced Surface Water Treatment Rule, hereafter referred to as ''LT2'', on January 5, 2006 (71 FR 654, USEPA, 2006a). The LT2 applies to all PWSs that use surface water or ground water under the direct influence of surface water. The LT2 builds upon the IESWTR and the LT1 by improving control of microbial pathogens and by focusing on systems with elevated *Cryptosporidium* contamination risk. The purposes of the LT2 are to protect public health from illness arising from exposure to *Cryptosporidium* and other microbial pathogens in drinking water and to prevent significant increases in risks that might occur when systems implement drinking water disinfection byproduct rules.

Key provisions in the LT2 include: source water monitoring for *Cryptosporidium* (with a screening procedure to reduce monitoring costs for small systems); risk-targeted *Cryptosporidium* treatment by filtered systems with the highest source water *Cryptosporidium* levels; inactivation of *Cryptosporidium* by all unfiltered systems; criteria for the use of *Cryptosporidium* treatment and control processes; and covering or treating uncovered finished water storage facilities.

The LT2 requires PWSs using surface water or ground water under the direct influence of surface water to monitor their source waters for *Cryptosporidium* and/or *E. coli* to identify additional treatment requirements. PWSs must monitor their source water (*i.e.,* the influent water entering the treatment plant) over two different timeframes (defined as Round 1 and Round 2) to determine the occurrence of *Cryptosporidium.* Monitoring results determine the extent of *Cryptosporidium* treatment requirements under the LT2. According to the LT2 rule requirements, all PWSs were to complete Round 2 by 2021. To reduce monitoring costs, small filtered PWSs (serving fewer than 10,000 people) which initially monitor for *E. coli* for one year as a screening analysis, are required to monitor for *Cryptosporidium* only if their *E. coli* levels exceed specified trigger values. Small filtered PWSs that exceed the *E. coli* trigger, as well as small unfiltered PWSs, must monitor for *Cryptosporidium* for one or two years, depending on the sampling frequency. The LT2 also requires all unfiltered PWSs to provide at least 2 to 3-log (*i.e.,* 99 to 99.9 percent) inactivation of *Cryptosporidium.* Further, under the LT2, unfiltered PWSs must achieve their overall inactivation requirements (including *Giardia lamblia* and virus inactivation as established by earlier regulations) using a minimum of two disinfectants.

Under the LT2, PWSs with uncovered finished water reservoirs (UCFWR) must either cover the storage facility or treat the water leaving the storage facility to achieve inactivation and/or removal of 4-log virus, 3-log *Giardia lamblia* and 2-log *Cryptosporidium* using a protocol approved by the state (USEPA, 2006a). Most finished water reservoirs for surface water systems are covered. All PWSs with UCFWRs are under administrative orders or compliance agreements to cover or treat their UCFWR.

Summary of Review Results

From a review of the literature on *Cryptosporidium* health effects, EPA concludes that there is no new health information to suggest a need to modify the LT2. In addition, EPA determined that no regulatory revisions to the microbial toolbox options are appropriate at this time. During Six-Year Review 4, EPA did not consider disinfection profiling information since EPA is evaluating overall filtration and disinfection requirements in the SWTRs as part of the on-going consideration of potential revisions to the MDBP rules. For more information regarding EPA's review of treatment feasibility see the ''Six-Year Review 4 Technical Support Document for Microbial Contaminant Regulations'' (USEPA, 2024m).

Health Effects

Since 1995, cryptosporidiosis has been a nationally notifiable disease, meaning healthcare providers and laboratories that diagnose cases of laboratory-confirmed cryptosporidiosis are required to report cases to their local or state health departments, which in turn report the cases to CDC. Since 2012, there have been four reported outbreaks of cryptosporidiosis from public water systems to CDC. The four outbreaks together resulted in a total of 201 recorded illnesses, 2 hospitalizations, and no deaths (CDC, 2022). Although cryptosporidiosis is a nationally notifiable disease, additional outbreaks may go unreported to CDC or may have been recorded as of uncertain causes. In addition, since CDC's National Outbreak Reporting System is specifically focused on outbreaks, it does not capture rates of endemic disease of cryptosporidiosis from drinking water.

Occurrence and Exposure

Based on the LT2 source water monitoring results, filtered systems were classified in one of four risk categories (Bins 1–4) to determine additional treatment needed. Systems in Bin 1 are not required to provide additional *Cryptosporidium* treatment. Systems in Bins 2–4 must achieve 1.0–2.5 log of treatment (*i.e.,* 90 to 99.7 percent reduction for *Cryptosporidium*) over and above that provided by conventional treatment, depending on the *Cryptosporidium* concentrations. Filtered PWSs must meet the additional *Cryptosporidium* treatment requirements in Bins 2, 3, or 4 by selecting one or more technologies from the microbial toolbox to ensure source water protection and management, and/or *Cryptosporidium* removal or inactivation. All unfiltered water systems must provide at least 99 or 99.9 percent (2 or 3-log) inactivation of *Cryptosporidium,* depending on their monitoring results. All filtered systems that provide 5.5 log treatment for *Cryptosporidium* are exempt from monitoring and subsequent bin classification.

Six years after the initial bin classification following a first round of monitoring, filtered systems were required to conduct a second round of monitoring. Round 2 monitoring began in 2015. Round 2 monitoring was implemented to understand year-to-year variability for occurrence of *Cryptosporidium.* The difference observed between occurrence at the time of the ICR Supplemental Surveys and the LT2 Round 1 monitoring indicates year-to-year variability (USEPA, 2017a).

Limited occurrence data for *Cryptosporidium* was available to EPA in response to the SYR 4 ICR since fewer than 1 percent of the *Cryptosporidium* monitoring records provided actual concentration levels with units of oocysts/L; however, the data about system binning for about 300 PWSs serving populations larger than 10,000 was provided. Those data indicate that the percentage of PWSs potentially moving to an ''action bin'' based on Round 2 monitoring would not be substantially higher than the percentage estimated based on modeling conducted during the LT2 review included as part of the Six-Year Review 3, thus suggesting no change to the review decision made under Six-Year Review 3.

Treatment Feasibility

The LT2 includes a variety of treatment and control options, collectively termed the ''microbial toolbox,'' that PWSs can implement to comply with the LT2's additional *Cryptosporidium* treatment requirements. Most options in the microbial toolbox carry prescribed credits toward *Cryptosporidium* treatment and control requirements. The LT2 Toolbox Guidance Manual (USEPA, 2010e) provides guidance on how to apply the toolbox options.

For the Six-Year Review 4, EPA reviewed additional research into the relationship between ultraviolet light (UV) dose and log inactivation. Some studies showed the same log inactivation at UV doses lower than those reported in previous EPA guidance, and other studies showed log inactivation at UV doses higher than those contained in the guidance. Since there is not a consensus of log inactivation at levels significantly lower than EPA prior published guidance, EPA concludes that the new information does not support changes to the UV dose table.

EPA also reviewed new information pertaining to technologies, which have not been included in the existing LT2 toolbox guidance manual, and which may be effective for the removal or inactivation of protozoa including *Cryptosporidium.* In addition, EPA also reviewed new technologies that water systems may be employing to improve treatment performance for complying with the MDBP rules, *e.g.,* turbo coagulation and powdered activated carbon. Initiatives by states and EPA's Area Wide Optimization Program were evaluated as well. EPA found that this new information appears insufficient to develop quantification criteria for inactivation and removal credit for *Cryptosporidium.*

3. Ground Water Rule

Background

EPA promulgated the Ground Water Rule (GWR) in 2006 (71 FR 65574, USEPA, 2006b) to provide protection against microbial pathogens in PWSs using ground water sources. The rule establishes a risk-based approach to target undisinfected ground water systems that are vulnerable to fecal contamination. In addition to the protection provided by the RTCR and GWR monitoring requirements, systems that do not disinfect are also protected by the sanitary survey provisions of the GWR and the treatment technique provisions of the RTCR.

The GWR required compliance beginning December 1, 2009. Since the triggered source water monitoring provision was built upon the compliance monitoring results of total coliform and *E. coli* under the TCR and later RTCR, implementation of the GWR was not yet completed for the period of time covered by the Six-Year Review 3 ICR (2006–2011). The RTCR was promulgated in 2013 and became effective on April 1, 2016. EPA expected that implementation of the RTCR might impact the percent of ground water systems that would be triggered into source water monitoring and taking any corrective actions under the GWR. Therefore, the effects of the GWR and the RTCR implementation in addressing vulnerable ground water systems were not reviewed during the Six-Year Review 3 process.

Summary of Review Results

The information considered during this review suggest that microbial pathogens have been detected in untreated ground water samples which show no presence of fecal indicators, however these studies are limited in quantity and the prevalence of endemic disease from microbial contamination of untreated ground water cannot be well characterized with the available information (USEPA, 2024m). Additional and more robust studies are needed to further understand the magnitude of the issue. EPA concludes that no regulatory revisions to the GWR are appropriate at this time.

Health Effects

Waterborne pathogens can cause mild to severe illnesses (Wallender et al., 2014). These illnesses may include; acute gastrointestinal illness (AGI) with diarrhea, abdominal pain/discomfort, nausea, vomiting, conjunctivitis, aseptic meningitis, and hand-foot-and-mouth disease. Infections from some waterborne pathogens (*e.g., Campylobacter*) may cause long-term implications, such as reactive arthritis, Guillain-Barré syndrome, and irritable bowel syndrome (Keithlin et al., 2014). Other more severe illnesses include hemolytic uremic syndrome (HUS) (kidney failure), hepatitis, and bloody diarrhea (WHO, 2004).

Some studies have indicated that waterborne pathogens such as adenovirus, enteroviruses, hepatitis A, norovirus, rotavirus, *Salmonella, Giardia, Cryptosporidium,* and *Shigella* have been found in untreated ground water samples (Borchardt et al., 2012; Wallender et al., 2014; Stokdyk et al., 2020).

Human enteric viruses have been detected in drinking water free of bacterial indicators, such as total coliform. With total coliform detections rates similar to the average rate for

undisinfected community PWSs in the U.S, Borchardt et al. (2012) estimated a six to 22 percent attributable risk for enteric illness from viruses present in the communities' drinking water. In another study, Burch et al. (2022) found that noncommunity wells had higher infection risk than community wells. Burch et al. (2022) found the annual risk was relatively high for all pathogens combined in the study, while the average daily doses for individual pathogens were low, indicating that significant risk results from sporadic pathogen exposure. Studies by Fout et al. (2017) and Stokdyk et al. (2020) found that total coliform (and other indicators like *E. coli,* somatic phage, HF183, and Bacteroidales-like HumM2) tend to have high specificity, meaning that absence of the indicator provides relatively strong assurance that water is free of viral and other pathogens, but also have low sensitivity, meaning that presence of the indicator does not necessarily predict presence of pathogens.

Occurrence and Exposure

Similar to the RTCR, EPA examined the national compliance monitoring data collected for the Six-Year Review 4 to understand how total coliform and *E. coli,* indicators of contamination behaved before and after implementation of the GWR, as well as understanding how level of contamination for high risk undisinfected ground water systems have changed.

As noted, GWR monitoring is based on initial monitoring under the RTCR. If a system has a positive total coliform sample (based on routine coliform monitoring under the RTCR), the system must test that sample for the presence of *E. coli.* Under the GWR, ground water systems that do not provide at least 4-log treatment of viruses and are notified of a routine positive total coliform sample collected under RTCR must collect and analyze at least one source water sample for *E. coli* or other fecal indicators from each ground water source (well) within 24 hours. If the triggered source water sample has a positive for *E. coli* the ground water systems must take corrective action. EPA conducted a distribution system total coliform/*E. coli* data exploration and analysis effort to identify findings that could inform the risk reduction of the fully implemented GWR, as well as characterize high risk systems.

The national average total coliform and *E. coli* rates (*i.e.,* total number of positives divided by total number of samples) before and after implementation of the GWR were calculated using Six-Year Review 3 and Six-Year Review 4 datasets. The analytical results were grouped by system sizes and disinfection status (*i.e.,* disinfecting versus and undisinfected). The period of analysis was from 2007–2008 (before the GWR was implemented) to 2014–2015 (after the completed implementation of the first round of sanitary surveys under the GWR). The total coliform rates across different system categories decreased, suggesting that there may be less pathogenic contamination pathways and so potentially less microbial exposure, corresponding to the period when the GWR was being implemented. This downward change is supported by a statistical significance test. The declining count of the fecal contamination indicator, *E. coli* was not supported by a test of statistical significance. Yet numbers of *E. coli* positives were consistently low, which may indicate low exposure to fecal contamination.

EPA performed a more specific analysis using a statistical model focused on the most vulnerable water systems, the undisinfected ground water systems. EPA conducted statistical modeling focused on examination of total coliform levels in small ground water systems to account for their infrequent sampling and relatively low level of monitoring observations compared to larger systems that monitor more frequently.

There are approximately 45,000 undisinfected ground water systems associated with total coliform records collected and less than 1 percent population among the population served by the public community water systems in the U.S. (based on SYR 4 ICR data). Most undisinfected ground water systems serve small permanent populations or transient populations.

EPA found that the smallest systems (serving a population fewer than 1,001) have higher median total coliform rates than undisinfected larger systems. In addition, the analysis indicates that median occurrence rates for many undisinfected transient systems may have fallen, from four to three percent total coliform detection rate from 2011 to 2019. Another finding from the statistical modeling is that the number of non-community systems that have high total coliform detections in the systems serving fewer than 1,001 people has remained roughly the same, about 7,000 undisinfected ground water systems, when running a comparison using Six-Year Review 3 and Six-Year Review 4 ICR data with a threshold of five percent rate of total coliform positive detections, which is the threshold that triggers a Level 1 Assessment in the RTCR. For statistical analysis of *E. coli* detection rates, there was not sufficient data to make estimates of averages and numbers of systems exceeding high levels.

Two implications of these modelling results should be noted as it relates to estimating potential exposure and occurrence. One is that the non-community systems serving fewer than 1,001 have total coliform positive rates around two to four percent, while a study of 14 community systems served by untreated ground water in Wisconsin found that a total coliform positive rate of 2.3 percent was associated AGI burden (Borchardt et al, 2012). EPA concludes, however, that studies indicating microbial disease burden at total coliform positive levels found in high-risk systems are limited in number as mentioned in the Health Effects section, as well as in geographic scope. Another implication from the results of this statistical analysis is that the remaining systems with very high total coliform rates could suggest compliance challenges among small ground water systems.

In addition to evaluating trends with indicators under RTCR to evaluate protection for vulnerable ground water systems, EPA also considered the results from the GWR requirement for triggered source water sampling. The sample results indicate that there is a small percent of positive source water *E. coli* detections ranging from 0.76 percent to 1.99 percent of *E. coli* samples for non-community systems which are primarily undisinfected systems, and 250 out of 270 of source water *E. coli* detections were associated with undisinfected systems serving fewer than 500 people. The other fecal indicators, coliphage and enterococci were used very infrequently, and data was insufficient to evaluate. Low incidence of fecal indicators may indicate low exposure to fecal contamination among undisinfected ground water systems.

Treatment Feasibility

Per treatment technique requirements under the GWR, there are two scenarios that trigger ground water systems to take corrective actions: (1) positive results of the triggered source water monitoring, and (2) significant deficiencies found during Sanitary Survey (EPA was not able to assess sanitary surveys directly given data limitations). EPA evaluated whether treatment was improving under the GWR by using the RTCR occurrence analysis data to consider total coliform rates before and after the GWR was implemented.

EPA developed a systematic approach to identify disinfection status of ground water systems for each of the years included in the Six-Year Review ICR datasets and found that the percentage of ground water systems that were disinfecting had increased consistently from 2007–2008 (before the GWR was implemented) to 2014–2015. This finding of an increasing number of systems disinfecting could be attributable to systems taking corrective actions to address positive results after triggered source water monitoring. The analytical results presented in the ''Six-Year Review 4 Technical Support Document for Microbial Contaminant Regulations'' (USEPA, 2024m) also indicate that disinfecting ground water systems had substantially lower total coliform positive rates than undisinfected ground water systems. In addition, EPA also observed that the total coliform positive rates decreased after completion of the first round of sanitary surveys under the GWR among ground water systems.

4. Aircraft Drinking Water Rule

Background

EPA promulgated the Aircraft Drinking Water Rule (ADWR) on October 19, 2009 (74 FR 53590, USEPA, 2009b). The primary purpose of the ADWR is to ensure that safe and reliable drinking water is provided to aircraft passengers and crew. This entails providing air carriers with a feasible way to comply with SDWA and NPDWRs. The existing NPDWRs were designed for traditional, stationary public water systems not mobile aircraft water systems that are operationally different. For example, aircraft fly to multiple destinations throughout the course of any given day and may board drinking water from sources at any of these destinations. Aircraft board water from airport watering points via temporary connections. Aircraft drinking water safety depends on a number of factors including the quality of the water that is boarded from these multiple sources, the care used to board the water, and the operation and maintenance of the onboard water system and the water transfer equipment.

The ADWR's provisions protect against disease-causing microbiological contaminants through the required development and implementation of aircraft water system operations and maintenance plans. The ADWR's provisions include: routine disinfection and flushing of the water system, air carrier training requirements for key personnel, and periodic sampling of the onboard drinking water, as well as self-inspections of each aircraft water system and immediate notification of passengers and crew when violations or specific situations occur.

Summary of Review Results

The ADWR is a unique rule within the context of the SDWA. This rule applies only to aircraft engaged in interstate commerce with onboard systems that provide water for human consumption through pipes. These aircraft water systems board finished water for human consumption and regularly serve an average of at least twenty-five individuals daily, at least 60 days out of the year. Human consumption includes water for drinking, hand washing, food preparation, and oral hygiene. From a review of available technical information within the scope of the review, EPA concludes that there is no new information to suggest that regulatory revisions to the ADWR are appropriate at this time.

Health Effects

Limited new literature is available on the presence of microbial pathogens in aircraft drinking water. Handschuh et al. (2015) found that long-haul flights were significantly poorer in terms of microbial water quality than short haul flights. A follow-up study by Handschuh et al. (2017) demonstrated that there is a diversity of microorganisms within the aircraft drinking water supply chain.

Other studies have also found microbial contaminants present in aircraft drinking water, including *Pseudomonas aeruginosa,* enterococci, clostridia, and *Salmonella* (WHO, 2009; Schaeffer et al., 2012). Tracking an illness back to contaminated water served on an aircraft presents a technical challenge. Most disease incubation periods are longer than the duration of a flight, and even if it is possible to determine that a disease was incurred in air travel, it may be difficult to determine if the route of transmission was from beverages, food, or close proximity of people, and to determine whether transmission happened on board the aircraft or at an air terminal.

Occurrence and Exposure

The Aircraft Reporting and Compliance System (ARCS) is used to facilitate the reporting of aircraft water system data under the ADWR. Air carriers subject to the ADWR must report to EPA about their inventory of aircraft water system fleet; the date the operations and maintenance plan was developed; the date the coliform sampling plan was developed; the date the aircraft water system sampling plan(s) was incorporated into the aircraft water system Operations and Maintenance plan; the date the Operations and Maintenance plan(s) was incorporated into the U.S. Federal Aviation Administration (FAA) accepted air carrier Operation and Maintenance program; the frequency for routine disinfection and flushing, and the corresponding routine total coliform sampling frequency; and the date for routine disinfection and flushing, routine coliform sampling dates and results, and corrective actions (when applicable).

For Six-Year Review 4, EPA downloaded and reviewed compliance monitoring data available in ARCS as of May 2021. Approximately 140,000 records of aircraft water systems compliance monitoring data for total coliform and *E. coli* samples were available in ARCS from February 2011 through May 2021, including results reported for more than 70 different makes/models of aircraft. These results were used to characterize the positivity rates of total coliform and *E. coli* in aircraft water systems on an annual basis for the years that data were available (2011–2021) and for the subset of years 2012 through 2019. This approach removes potentially confounding considerations associated with evaluating data for calendar year 2020 when a large number of aircraft PWS were inactive due to COVID–19, as well as years 2011 and 2021 for which the ARCS data evaluated represents partial years.

Monitoring data broken down by year for the years 2012–2019 shows an average annual total coliform positivity rate of 5.46 percent, with a median of 5.63 percent, a minimum of 3.76 percent and a maximum of 7.03 percent. The total coliform positivity rate decreased on an annual basis from 2012–2019. The average *E. coli* positivity rate was 0.26 percent, and the median rate was also 0.26 percent, with a minimum of 0.17 percent and a maximum of 0.33 percent. The *E. coli* positivity rate also decreased on an annual basis.

Treatment Feasibility

Under the ADWR, air carriers routinely disinfect and flush aircraft water systems at the frequency recommended by the water system manufacturer or, if not specified by the manufacturer, they may choose from one of four options. If corrective disinfection and flushing is chosen or required, air carriers follow the procedures in their O&M plans. Unscheduled flight disruptions to

perform corrective disinfection and flushing can be minimized by shutting off the water or preventing the flow of water to the taps. Before allowing unrestricted access to the aircraft water system, a complete set of follow-up samples must be collected and submitted for analysis after the disinfection and flushing event if triggered by a total coliform-positive sample and must be reported as total coliform-negative if triggered by an *E. coli*-positive sample. One study was identified that examined the effectiveness of disinfection and flushing procedures to prevent coliform persistence in aircraft water systems (Szabo et al., 2019). That study showed that coliforms were not persistent on the aircraft plumbing surfaces, and coliforms were not detected after disinfection and flushing. However, it noted an exception for the aerator installed in the lavatory faucet which was coliform positive after disinfection with ozone and mixed oxidants; disinfection with glycolic acid and quaternary ammonia showed no detectable coliforms on aerators after 30 minutes of soaking in the disinfectants.

Each aircraft water system must be inspected by the air carrier at least every 5 years according to the procedures in their O&M plans. At a minimum, the self-inspection procedures for an aircraft water system must include inspection of the storage tank, distribution system, supplemental treatment, fixtures, valves, and backflow prevention devices. Any deficiencies detected must be addressed, and any deficiency that is unresolved within 90 days of identification of the deficiency must be reported to EPA.

5. Filter Backwash Recycling Rule

EPA promulgated the Filter Backwash Recycling Rule (FBRR) on June 8, 2001 (66 FR 31086, USEPA, 2001a). The rule aimed to increase public health protection by addressing microbial contaminant risks associated with filter backwash recycling practices. The rule required certain systems to return recycled filter backwash water, sludge thickener supernatant, and liquids from dewatering processes to a location in the system such that all filtration processes of a system are employed, or at an alternate location if approved by the State. In addition, the rule required systems that employ conventional filtration or direct filtration to notify States of their recycling practices by June 8, 2004, and after then to keep and retain records on file about their recycle flows for subsequent review and evaluation by the State. There are no ongoing monitoring requirements associated with the FBBR.

EPA reviewed available State data collected under the ICR; however, the EPA did not identify any new and relevant information that would indicate that revisions to the NPDWR at this time are appropriate.

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ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 180

[EPA–HQ–OPP–2023–0221; FRL–11818–01–OCSPP]

Trichoderma Atroviride Strain AT10; Exemption From the Requirement of a Tolerance

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: This regulation establishes an exemption from the requirement of a