**Section 611.330 Maximum Contaminant Levels for Radionuclides**

a) This subsection (a) corresponds with 40 CFR 141.66(a), marked reserved by USEPA. This statement maintains structural consistency with USEPA rules.

b) MCL for Combined Radium-226 and -228. The MCL for combined radium-226 and radium-228 is 5 pCi/L. Determine the combined radium-226 and radium-228 value by adding the results of analyses for radium-226 and radium-228.

c) MCL for Gross Alpha Particle Activity (Excluding Radon and Uranium). The MCL for gross alpha particle activity (including radium-226 but excluding radon and uranium) is 15 pCi/L.

d) MCL for Beta Particle and Photon Radioactivity

1) The average annual concentration of beta particle and photon radioactivity from man-made radionuclides in drinking water must not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem/year (mrem/year).

2) Except for the radionuclides in this subsection (d)(2), the supplier must calculate the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents on the basis of two liters per day drinking water intake using the 168-hour data list in NBS Handbook 69 (63), incorporated by reference in Section 611.102. If two or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ must not exceed 4 mrem/year.

|  |  |  |  |
| --- | --- | --- | --- |
| Average Annual Concentrations Assumed to Produce  a Total Body or Organ Dose of 4 mrem/yr | | | |
| Radionuclide | | Critical organ | pCi per liter |
|  | |  |  |
| 1. | Tritium | Total body | 20,000 |
| 2. | Strontium-90 | Bone marrow | 8 |

BOARD NOTE: USEPA listed factors for computing the fraction of the maximum permissible annual dose of 4 mrem/yr based on NBS Handbook 69 (63) in Appendix I (Comparison of Derived Values of Beta and Photon Emitters), Implementation Guidance for Radionuclides, EPA 816-F-00-002. The units for these factors allow direct use for computing fractional dose equivalents. The Board listed USEPA’s conversion factors in Table R, including information about applying the factors to determine compliance.

e) MCL for Uranium. The MCL for uranium is 30 μg/L.

f) Combined Radium-226 and -228, Gross Alpha Particle Activity, Gross Beta Particle and Photon Radioactivity, and Uranium. A CWS supplier must comply with the MCLs listed in subsections (b) through (e), determining compliance as Subpart Q provides.

g) Best Available Technologies (BATs) for Radionuclides. USEPA identifies the BAT for complying with the MCLs for combined radium-226 and -228, uranium, gross alpha particle activity, and beta particle and photon radioactivity:

|  |  |  |
| --- | --- | --- |
| BAT for Combined Radium-226 and Radium-228, Uranium, Gross Alpha Particle Activity, and Beta Particle and Photon Radioactivity | | |
| Contaminant | | BAT |
|  | |  |
|  | Combined radium-226 and radium-228 | Ion exchange, reverse osmosis, lime softening |
|  | Uranium | Ion exchange, reverse osmosis, lime softening, coagulation/ filtration |
|  | Gross alpha particle activity (excluding radon and uranium) | Reverse osmosis |
|  | Beta particle and photon radioactivity | Ion exchange, reverse osmosis |

h) Small Systems Compliance Technologies List for Radionuclides. USEPA identified BAT as affordable technology, treatment techniques, or other means available to suppliers serving 10,000 or fewer people for achieving compliance with the radionuclides MCLs in subsections (a) through (e).

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| --- | --- | --- | --- | --- |
| List of Small Systems Compliance Technologies for  Radionuclides and Limitations to Use | | | | |
| Unit technologies | | Limitations  (see footnotes) | Operator skill level  required1 | Raw water quality range and considerations1 |
| 1. | Ion exchange  (IE) | (a) | Intermediate | All ground waters |
| 2. | Point of use  (POU2) IE | (b) | Basic | All ground waters |
| 3. | Reverse osmosis  (RO) | (c) | Advanced | Surface waters usually require pre-filtration |
| 4. | POU2 RO | (b) | Basic | Surface waters usually require pre-filtration |
| 5. | Lime softening | (d) | Advanced | All waters |
| 6. | Green sand filtration | (e) | Basic |  |
| 7. | Co-precipitation with Barium sulfate | (f) | Intermediate to advanced | Ground waters with suitable water quality |
| 8. | Electrodialysis/ electrodialysis reversal |  | Basic to intermediate | All ground waters |
| 9. | Pre-formed hydrous Manganese oxide filtration | (g) | Intermediate | All ground waters |
| 10. | Activated alumina | (a), (h) | Advanced | All ground waters; competing anion concentrations may affect regeneration frequency |
| 11. | Enhanced coagulation/ filtration | (i) | Advanced | Can treat a wide range of water qualities |
| 1 | National Research Council (NRC). "Safe Water from Every Tap: Improving Water Service to Small Communities", National Academy Press, Washington, D.C. 1997. | | | |
| 2 | A POU, or "point-of-use" technology is a treatment device at a single consumer's tap for reducing contaminants in drinking water at that tap. POU devices are typically on a kitchen tap.  BOARD NOTE: USEPA refers to the notice of data availability (NODA) at 66 Fed. Reg. 21576 (April 21, 2000) for details. | | | |

Limitations Footnotes: Technologies for Radionuclides

(a) The regeneration solution contains high concentrations of the contaminant ions. A supplier should carefully consider disposal options before choosing this technology.

(b) When a supplier uses POU devices to comply, the supplier must provide programs for long-term operation, maintenance, and monitoring to ensure proper performance.

(c) The supplier should carefully consider reject water disposal options before choosing this technology.

BOARD NOTE: In corresponding 40 CFR 141.66, Table C, footnote c states in part: "See other RO limitations described in the SWTR Compliance Technologies Table." USEPA based Table C on "Table 13. − Technologies for Radionuclides" appearing at 63 Fed. Reg. 42032, 42043 (Aug. 6, 1998). Table 13 refers to "Table 2. − SWTR Compliance Technology Table: Filtration". That Table 2, at 63 Fed. Reg. at 42036, lists the limitations on RO:

d Blending (combining treated water with untreated raw water) cannot be practiced at risk of increasing microbial concentrations in finished water.

e Post-disinfection recommended as a safety measure and for residual maintenance.

f Post-treatment corrosion control will be needed prior to distribution.

(d) The combination of variable source water quality and the complexity of the water chemistry involved may make this technology too complex for a small surface water system.

(e) Removal efficiencies can vary depending on water quality.

(f) This technology may be very limited in application to small systems. Since the process requires static mixing, detention basins, and filtration, it is most applicable to systems with sufficiently high sulfate levels that already have a suitable filtration treatment train in place.

(g) This technology is most applicable to small systems that already have filtration in place.

(h) Handling chemicals required during regeneration and pH adjustment may be too difficult for small systems without an adequately trained operator.

(i) Assumes modification of a coagulation/filtration process already in place.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Compliance Technologies by System Size Category  for Radionuclide NPDWRs | | | | |
|  | | Compliance Technologies for System Size Categories (Population Served) | | |
| Contaminant | | 25-500 | 501-3,300 | 3,300-10,000 |
|  | |  |  |  |
| 1. | Combined radium-226  and radium-228 | 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1, 2, 3, 4, 5, 6, 7, 8, 9 |
|  |  |  |  |  |
| 2. | Gross alpha particle  activity | 3, 4 | 3, 4 | 3, 4 |
|  |  |  |  |  |
| 3. | Beta particle activity  and photon activity | 1, 2, 3, 4 | 1, 2, 3, 4 | 1, 2, 3, 4 |
|  |  |  |  |  |
| 4. | Uranium | 1, 2, 4, 10, 11 | 1, 2, 3, 4, 5, 10, 11 | 1, 2, 3, 4, 5, 10, 11 |

Note: Numbers correspond to the numbered technologies in the above table, "List of Small Systems Compliance Technologies for Radionuclides and Limitations to Use".

BOARD NOTE: This Section derives from 40 CFR 141.66.

(Source: Amended at 47 Ill. Reg. 16486, effective November 2, 2023)