

ORDER OF THE STATE OF WISCONSIN NATURAL RESOURCES BOARD
REPEALING AND RECREATING, AND CREATING RULES

The State of Wisconsin Natural Resources Board proposes an order to repeal and recreate NR 809.50 and 809.53; and to create NR 809.515, 809.52(2) to (5) and 809.905 relating to safe drinking water standards for radionuclides

DG-26-01

Statutory authority: ss. 280.11 and 281.17(8), Stats.
Statutes interpreted: ss. 280.11 and 281.17(8), Stats.

The U.S. Environmental Protection Agency published amendments to 40 CFR Parts 141 and 142 on December 7, 2000. Section 281.17(8), Stats., and our primacy agreement with U.S. EPA require us to adopt rules at least as stringent as federal regulations. These proposed amendments are necessary to assure that our administrative rules are consistent with federal regulations.

The final radionuclide rule published by U.S. EPA on December 7, 2000 established a new maximum contaminant level (MCL) for uranium and amends monitoring requirements for radionuclides while keeping the current MCL for combined radium 226 plus radium 228 at 5 pCi/l.

SECTION 1. NR 809.50 is repealed and recreated to read:

NR 809.50 Maximum contaminant levels, compliance dates and best available technologies for radionuclides. The following are the maximum contaminant levels, compliance dates and best available technologies for radium-226, radium-228 and gross alpha particle radioactivity:

(1) MAXIMUM CONTAMINANT LEVELS FOR RADIONUCLIDES. The following are the maximum contaminant levels for radium-226, radium-228 and gross alpha particle radioactivity:

(a) MCL FOR COMBINED RADIUM-226 AND RADIUM-228. The maximum contaminant level for combined radium-226 and radium-228 is 5 pCi/l. The combined radium-226 and radium-228 value is determined by the addition of the results of the analysis for radium-226 and the analysis for radium-228.

(b) MCL FOR GROSS ALPHA PARTICLE ACTIVITY, EXCLUDING RADON AND URANIUM. The maximum contaminant level for gross alpha particle activity, including radium-226 but excluding radon and uranium, is 15 pCi/l.

(c) MCL FOR URANIUM. The maximum contaminant level for uranium is 30 ug/l.

(2) COMPLIANCE DATES FOR COMBINED RADIUM-226 AND RADIUM-228, GROSS ALPHA PARTICLE ACTIVITY, GROSS BETA PARTICLE AND PHOTON RADIOACTIVITY AND URANIUM. Community water systems shall comply with the MCLs listed in sub.(1) and with s. NR 809.51(1) beginning December 8, 2003 and compliance shall be determined in accordance with the requirements of ss. NR 809.50 and 809.51. Compliance with reporting requirements for the radionuclides under appendix A to subch. VII is required on December 8, 2003.

(3) BEST AVAILABLE TECHNOLOGIES (BATs) FOR RADIONUCLIDES. The department identifies, as indicated in the following table, the best technology available for achieving compliance with the maximum contaminant levels for combined radium-226 and radium-228, uranium, gross alpha particle activity and beta particle and photo radioactivity. A community water system that must treat to reduce radionuclide levels below the MCLs specified in sub. (1) or s. NR 809.51 shall achieve compliance using one of the methods listed in table B, table C or table D.

Table B.--BAT for Combined Radium-226 and Radium-228, Uranium, Gross Alpha Particle Activity, and Beta Particle and Photon Radioactivity

Contaminant	BAT
1. Combined radium-226 and radium-228	Ion exchange, reverse osmosis, lime softening
2. Uranium	Ion exchange, reverse osmosis, lime softening, coagulation/ filtration
3. Gross alpha particle activity (excluding Radon and Uranium).	Reverse osmosis.
4. Beta particle and photon Ion exchange	Reverse osmosis. radioactivity

(4) SMALL WATER SYSTEMS COMPLIANCE TECHNOLOGIES FOR RADIONUCLIDES.

Unit technologies	Limitations(see foot- notes)	Operator skill level required ¹	Raw water quality range and consideration ¹
1. Ion exchange (IE).	(a)	Intermediate	All ground waters.
2. Point of use (POU ₂) IE	(b)	Basic	All ground waters
3. Reverse osmosis (RO)	(c)	Advanced	Surface waters usually require pre-filtration
4. POU ₂ 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 POU devices are typically installed at the kitchen tap. See the April 21, 2000 NODA for more details.

Limitations Footnotes: Technologies for Radionuclides:

^a The regeneration solution contains high concentrations of the contaminant ions. Disposal options should be carefully considered before choosing this technology.

^b When POU devices are used for compliance, programs for long-term operation, maintenance, and monitoring must be provided by water utility to ensure proper performance.

^c Reject water disposal options should be carefully considered before choosing this technology. See other RO limitations described in the SWTR Compliance Technologies Table.

^d The combination of variable source water quality and the complexity of the water chemistry involved may make this technology too complex for small surface water systems.

^e Removal efficiencies can vary depending on water quality.

^f This technology may be very limited in application to small water 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 water systems that already have filtration in place.

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

ⁱ Assumes modification to a coagulation/filtration process already in place

Contaminant	Compliance technologies ¹ for system size categories (population served)		
	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 those technologies found listed in the table C of s. NR 809.50.

SECTION 2. NR 809.515 is created to read:

NR 809.515 Maximum contaminant level goals for radionuclides. MCLGs for radionuclides, including combined radium-226 and radium-228, gross alpha particle activity (excluding radon and uranium), beta particle and photon radioactivity, and uranium, are zero for each contaminant.

SECTION 3. NR 809.52(2) to (5) are created to read:

NR 809.52(2) To determine compliance with s. NR 809.50(1), the detection limit may not exceed the concentrations in Table B.

Table B.--Detection Limits for Gross Alpha Particle Activity, Radium 226, Radium 228, and Uranium

Contaminant	Detection Limit
Gross alpha particle activity	3 pCi/l.
Radium 226	1 pCi/l.
Radium 228	1 pCi/l.
Uranium	Reserve

(3) To judge compliance with the maximum contaminant levels listed in s. NR 809.50, averages of data shall be used and shall be rounded to the same number of significant figures as the maximum contaminant level for the substance in question.

(4) For the purpose of monitoring radioactivity concentrations in drinking water, the required sensitivity of the radioanalysis is defined in terms of a detection limit. The detection limit shall be that concentration which can be counted with a precision of plus or minus 100% at the 95% confidence level, 1.96σ where σ is the standard deviation of the net counting rate of the sample.

(5) To determine compliance with s. NR 809.50(1)(a), the detection limit may not exceed one pCi/l. To determine compliance with s. NR 809.50(1)(b), the detection limit may not exceed 3 pCi/l. To determine compliance with s. NR 809.51, the detection limits may not exceed the concentrations listed in table C.

Table C--Detection Limits for Man-made Beta Particle and Photon Emitters	
Radionuclide Detection limit	
Tritium.	1,000 pCi/1.
Strontium-89	10 pCi/1.
Strontium-90	2 pCi/1.
Iodine-131	1 pCi/1.
Cesium-134	10 pCi/1.
Gross beta	4 pCi/1.
Other radionuclides	1/10 of the applicable limit

SECTION 4. NR 809.53 is repealed and recreated to read:

NR 809.53 Radioactivity monitoring frequency and compliance requirements for community water systems. (1) MONITORING REQUIREMENTS FOR GROSS ALPHA PARTICLE ACTIVITY, RADIUM-226, RADIUM-228 AND URANIUM. (a) Initial monitoring. Community water systems shall conduct initial monitoring to determine compliance with ss. NR 809.50(1) and 809.51(1) by December 31, 2007. For the purposes of monitoring for gross alpha particle activity, radium-226, radium-228, uranium and beta particle and photon radioactivity in drinking water, "detection limit" is defined in s. NR 809.52(4).

(b) Applicability and sampling location. Community water system applicability and sampling location requirements shall be as follows.

1. Applicability and sampling location for existing community water systems or sources. All existing community water systems shall sample at every entry point to the distribution system that is representative of all sources being used, hereafter called a sampling point, under normal operating conditions. The community water system shall take each sample at the same sampling point unless conditions make another sampling point more representative of each source or the department has designated a distribution system location, in accordance with par. (c)2.c.

2. Applicability and sampling location for new community water systems or sources. All new community water systems or community water systems that use a new source of water shall begin to conduct initial monitoring for the new source within the first quarter after initiating use of the source. Community water systems shall conduct more frequent monitoring when ordered by the department in the event of possible contamination or when changes in the distribution system or treatment processes occur which may increase the concentration of radioactivity in finished water.

(c) Initial monitoring. Community water systems shall conduct initial monitoring for gross alpha particle activity, radium-226, radium-228 and uranium as follows:

1. Except as provided in subd. 2., a community water system shall collect 4 consecutive quarterly samples at all sampling point before December 31, 2007.

2. As an alternative to the requirement of subd. 1., a community water system may use historical monitoring data collected at a sampling point to satisfy the initial monitoring requirements for that sampling point for the following situations:

a. To satisfy initial monitoring requirements, a community water system having only one entry point to the distribution system may use the monitoring data from the last compliance monitoring period that began between June 1, 2000 and December 8, 2003.

b. To satisfy initial monitoring requirements, a community water system with multiple entry points and having appropriate historical monitoring data for each entry point to the distribution system may use the monitoring data from the last compliance monitoring period that began between June 1, 2000 and December 8, 2003.

c. To satisfy initial monitoring requirements, a community water system with appropriate historical data for a representative point in the distribution system may use the monitoring data from the last compliance monitoring period that began between June 1, 2000 and December 8, 2003, provided that the department finds that the historical data satisfactorily demonstrate that each entry point to the distribution system is expected to be in compliance based upon the historical data and reasonable assumptions about the variability of contaminant levels between entry points. The department shall make a written finding indicating how the data conforms to these requirements.

3. For gross alpha particle activity, uranium, radium-226 and radium-228 monitoring, the department may waive the final 2 quarters of initial monitoring for a sampling point if the results of the samples from the previous 2 quarters are below the detection limit.

4. If the average of the initial monitoring results for a sampling point is above the MCL, the community water system shall collect and analyze quarterly samples at that sampling point until the community water system has results from 4 consecutive quarters that are at or below the MCL, unless the community water system enters into another schedule as part of a formal compliance agreement with the department.

(d) Reduced monitoring. The department may allow community water systems to reduce the future frequency of monitoring from once every 3 years to once every 6 or 9 years at each sampling point, based on the following criteria:

1. If the average of the initial monitoring results for each contaminant, i.e., gross alpha particle activity, uranium, radium-226 or radium-228, is below the detection limit specified in s. NR 809.50(3), table B, the community water system shall collect and analyze for that contaminant using at least one sample at that sampling point every 9 years.

2. For gross alpha particle activity and uranium, if the average of the initial monitoring results for each contaminant is at or above the detection limit but at or below one-half the MCL, the community water system shall collect and analyze for that contaminant using at least one sample at that sampling point every 6 years. For combined radium-226 and radium-228, the analytical results shall be combined. If the average of the combined initial monitoring results for radium-226 and radium-228 is at or above the detection limit but at or below one-half the MCL, the community water system shall collect and analyze for that contaminant using at least one sample at that sampling point every 6 years.

3. For gross alpha particle activity and uranium, if the average of the initial monitoring results for each contaminant is above one-half the MCL but at or below the MCL, the community water systems shall collect and analyze at least one sample at that sampling point every 3 years. For combined radium-226 and radium-228, the analytical results shall be combined. If the average of the combined initial monitoring results for radium-226 and radium-228 is above one-half the MCL, but at or below the MCL, the community water system shall collect and analyze at least one sample at that sampling point every 3 years.

4. Community water systems shall use the samples collected during the reduced monitoring period to determine the monitoring frequency for subsequent monitoring periods. For example, if a community water system's sampling point is on a 9-year monitoring period, and the sample result is above one-half MCL, then the next monitoring period for the sampling point is 3 years.

5. If a community water system has a monitoring result that exceeds the MCL while on reduced monitoring, the community water system shall collect and analyze quarterly samples at that sampling point until the community water system has results from 4 consecutive quarters that are below the MCL, unless the community water system enters into another schedule as part of a formal compliance agreement with the department.

(e) Compositing. To fulfill quarterly monitoring requirements for gross alpha particle activity, radium-226, radium-228 or uranium, a community water system may composite up to 4 consecutive quarterly samples from a single entry point if analysis is done within a year of the first sample. The department will treat analytical results from the composited as the average analytical result to determine compliance with the MCLs and the future monitoring frequency. If the analytical result from the composited sample is greater than one-half MCL, the department may direct the community water system to take additional quarterly samples before allowing the community water system to sample under a reduced monitoring schedule.

(f) Gross alpha particle activity measurement substitutions. A gross alpha particle activity measurement may be substituted for the required radium-226 measurement provided that the measured gross alpha particle activity does not exceed 5 pCi/l. A gross alpha particle activity measurement may be substituted for the required uranium measurement provided that the measured gross alpha particle activity does not exceed 15 pCi/l. The gross alpha measurement shall have a confidence interval of 95% ($1.65 \times$ standard deviation of the net counting rate of the sample) for radium-226 and uranium. When a community water system uses a gross alpha particle activity measurement in lieu of a radium-226 or uranium or both measurement, the gross alpha particle activity analytical result shall be used to determine the future monitoring frequency for radium-226 or uranium, or both. If the gross alpha particle activity result is less than detection, one-half the detection limit shall be used to determine compliance and the future monitoring frequency.

(2) MONITORING AND COMPLIANCE REQUIREMENTS FOR BETA PARTICLE AND PHOTON RADIOACTIVITY. To determine compliance with the maximum contaminant levels in s. NR 809.51 for beta particle and photon radioactivity, a community water system shall monitor at a frequency as follows:

(a) Community water systems designated by the department as vulnerable, shall sample for beta particle and photon radioactivity. Community water systems shall collect quarterly samples for beta emitters and annual samples for tritium and strontium-90 at each entry point to the distribution system, beginning within one quarter after being notified by the department. Community water systems already designated by the department shall continue to sample until the department reviews and either reaffirms or removes the designation.

1. If the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity at an entry point has a running annual average, computed quarterly, less than or equal to 50 pCi/l, the department may reduce the frequency of monitoring at that entry point to once every 3 years. Community water systems shall collect all samples required in this subsection during the reduced monitoring period.

2. For community water systems in the vicinity of a nuclear facility, the department may allow the community water system to utilize environmental surveillance data collected by the nuclear facility in lieu of monitoring at the community water system's entry points, where the department determines if the data is applicable to a particular community water system. In the event there is a release from a nuclear facility, community water systems which are using surveillance data shall begin monitoring at the community water system's entry points in accordance with this subsection.

3. At the discretion of the department, suppliers of water utilizing only ground waters may be required to monitor for manmade radioactivity.

(b) Community water systems designated by the department as utilizing waters contaminated by effluents from nuclear facilities shall sample for beta particle and photon radioactivity. Community water systems shall collect quarterly samples for beta emitters and iodine-131 and annual samples for tritium and strontium-90 at each entry point to the distribution system, hereafter called a sampling point, beginning within one quarter after being notified by the department. Community water systems already designated by the department as community water systems using waters contaminated by effluents from nuclear facilities shall continue to sample until the department reviews and either reaffirms or removes the designation.

1. Quarterly monitoring for gross beta particle activity shall be based on the analysis of monthly samples or the analysis of a composite of 3 monthly samples.

Note: Quarterly monitoring for gross beta particle activity based on the analysis of monthly samples is recommended.

2. For iodine-131, a composite of 5 consecutive daily samples shall be analyzed once each quarter. As ordered by the department, more frequent monitoring shall be conducted when iodine-131 is identified in the finished water.

3. Annual monitoring for strontium-90 and tritium shall be conducted by means of the analysis of a composite of 4 consecutive quarterly samples or analysis of 4 quarterly samples.

Note Annual monitoring for strontium-90 and tritium by means of the analysis of a composite of 4 consecutive quarterly samples is recommended.

4. If the gross beta particle activity beta minus the naturally occurring potassium-40 beta particle activity at a sampling point has a running annual average, computed quarterly, less than or equal to 15 pCi/l, the department may reduce the frequency of monitoring at that sampling point to every 3 years. Community water systems shall collect all samples required in this paragraph during the reduced monitoring period.

5. For community water systems in the vicinity of a nuclear facility, the department may allow the community water system to utilize environmental surveillance data collected by the nuclear facility in lieu of monitoring at the community water system's entry points, where the department determines if the data is applicable to a particular community water system. In the event that there is a release from a nuclear facility, community water systems which are using surveillance data shall begin monitoring at the community water system's entry points in accordance with this paragraph.

(c) Community water systems designated by the department to monitor for beta particle and photon radioactivity may not apply to the department for a waiver from the monitoring frequencies specified in either par. (a) or (b).

(d) Community water systems may analyze for naturally occurring potassium-40 beta particle activity from the same or equivalent sample used for the gross beta particle activity analysis. Community water systems may subtract the potassium-40 beta particle activity value from the total gross beta particle activity value to determine if 50 pCi/l is exceeded. The potassium-40 beta particle activity shall be calculated by multiplying elemental potassium concentrations, in mg/l, by a factor of 0.82.

(e) If the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity exceeds 50 pCi/l, an analysis of the sample shall be performed to identify the major radioactive constituents present in the sample and the appropriate doses shall be calculated and summed to determine compliance with s. NR 809.51(1) using the formula in s. NR 809.51(2). Doses shall also be calculated and combined for measured levels of tritium and strontium to determine compliance.

(f) Community water systems shall monitor monthly at the sampling points that exceed the maximum contaminant level in s. NR 809.51 beginning the month after the exceedance occurs. Community water systems shall continue monthly monitoring until the system has established, by a rolling average of 3 monthly samples, that the MCL is being met. Community water systems that establish that the MCL is being met shall return to quarterly monitoring until they meet the requirements in par. (a)1. or (b)4.

(3) GENERAL MONITORING AND COMPLIANCE REQUIREMENTS FOR RADIONUCLIDES. (a) The department may require more frequent monitoring than specified in subs. (1) and (2), or may require confirmation samples at its discretion. The results of the initial and confirmation samples shall be averaged for use in compliance determinations.

(b) Each public water system shall monitor at the time designated by the department during each compliance period.

(c) Compliance with ss. NR 809.50(1) and 809.51(1) shall be determined based on the analytical results obtained at each sampling point. If one sampling point is in violation of an MCL, the community water system is in violation of the MCL.

1. For community water systems monitoring more than once per year, compliance with the MCL is determined by a running annual average at each sampling point. If the average of any sampling point is greater than the MCL, the community water system is out of compliance with the MCL.

2. For community water systems monitoring more than once per year, if any sample result will cause the running annual average, as defined in this chapter, to exceed the MCL at any sample point, the community water system is out of compliance with the MCL immediately.

3. Community water systems shall include all samples taken and analyzed under this section in determining compliance, even if that number is greater than the minimum required.

4. If a community water system does not collect all required samples when compliance is based on a running annual average of quarterly samples, compliance shall be based on the running average of the samples collected.

5. If a sample result is less than the detection limit, zero will be used to calculate the annual average, unless a gross alpha particle activity is being used in lieu of radium-226 or uranium or both. If the gross alpha particle activity result is less than detection, $\frac{1}{2}$ the detection limit shall be used to calculate the annual average.

(d) The department may delete results of obvious sampling or analytic errors.

SECTION 5. NR 809.905 is created to read:

NR 809.905 Conditional waivers from the maximum contaminant levels for radionuclides.

(1) The department shall consider conditional waivers from the maximum contaminant levels for combined radium-226 and radium-228, uranium, gross alpha particle activity, excluding radon and uranium, and beta particle and photon radioactivity as follows:

(a) The department has identified the following as the best available technology, treatment techniques, or other means available for achieving compliance with the maximum contaminant levels for the radionuclides listed in ss. NR 809.50(1) and 809.51, for the purposes of issuing variances and exemptions, as shown in s. NR 809.50(3), table B.

(b) In addition, the department identifies the following as the best available technology, treatment techniques or other means available for achieving compliance with the maximum contaminant levels for the radionuclides listed in ss. NR 809.50(1) and 809.51 for the purposes of issuing conditional waivers to small drinking water systems, defined as those serving 10,000 persons or fewer, as shown in s. NR 809.50(4), table D.

(2) The department shall require community water systems to install or use or both any treatment technology identified in s. NR 809.50(3), Table B, or in the case of community water systems that serve 10,000 persons or fewer, s. NR 809.50(3), table C and table D, as a condition for granting a variance except as provided in sub. (3). If, after the system's installation of the treatment technology, the system cannot meet the MCL, the system shall be eligible for a variance under s. NR 809.90.

(3) If a community water system can demonstrate through comprehensive engineering assessments, which may include pilot plant studies, that the treatment technologies identified in this section would only achieve a de minimus reduction in the contaminant level, the department may issue a schedule for compliance that requires the system being granted the variance to examine other treatment technologies as a condition of obtaining the variance.

(4) If the department determines that a treatment technology identified under sub. (3) is technically feasible, the department may require the system to install or use or both that treatment

technology in connection with a compliance schedule issued under s. NR 809.90. The department's determination shall be based upon studies by the system and other relevant information.

(5) The department may require a community water system to use bottled water, point-of-use devices, point-of-entry devices or other means as a condition of granting a variance or an exemption from the requirements of s. NR 809.50 or 809.51 to avoid an unreasonable risk to health.

(6) Community water systems that use bottled water as a condition for receiving a variance or an exemption from s. NR 809.50 or 809.51 shall meet the requirements in either s. NR 809.90 (4)(a) or s. NR 809.90(4)(b) and (c).

(7) Community water systems that use point-of-use or point-of-entry devices as a condition for obtaining a variance or an exemption from the radionuclides MCLs shall meet the conditions in s. NR 809.90(3).

The foregoing rules were approved and adopted by the State of Wisconsin Natural Resources Board on October 24, 2001.

The rules shall take effect on the first day of the month following publication in the Wisconsin administrative register as provided in s. 227.22(2)(intro.), Stats.

Dated at Madison, Wisconsin

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

By

Darrell Bazzell, Secretary

(SEAL)