

during the period of the year designated by the department as the period when contamination by pesticides is most likely to occur.

(b) For community water systems utilizing only ground water sources, analyses shall be completed for those systems specified by the department.

(2) If the result of an analysis made under sub. (1) indicates that the level of any contaminant listed in s. NR 109.20 exceeds the maximum contaminant level, the supplier of water shall report to the department within 7 days and initiate 3 additional analyses within one month.

(3) When the average of 4 analyses made under sub. (2), rounded to the same number of significant figures as the maximum contaminant level for the substance in question, exceeds the maximum contaminant level, the supplier of water shall report to the department under s. NR 109.80 and give notice to the public under s. NR 109.81. Monitoring after the maximum contaminant level is exceeded shall be at a frequency designated by the department and shall continue until the maximum contaminant level has not been exceeded in 2 successive samples (special monitoring thereafter shall be at a frequency designated by the department) or until a monitoring schedule as a condition to a variance, exemption or enforcement action shall become effective.

(4) Analysis made to determine compliance with s. NR 109.20 (1) shall be conducted in accordance with "Methods for Organochlorine Pesticides and Chlorophenoxy Acid Herbicides in Drinking Water and Raw Source Water," available from ORD Publications, CERI, EPA, Cincinnati, Ohio 45268; or "Organochlorine Pesticides in Water," Annual Book of ASTM Standards, part 31, Water, Method D-3086-79; or Method 509-A, pp. 555-565 in "Standard Methods for the Examination of Water and Wastewater," 14th Edition; or "Gas Chromatographic Methods for Analysis of Organic Substances in Water," USGS, Book 5, Chapter A-3, pp. 24-39.

(5) Analysis made to determine compliance with s. NR 109.20 (2) shall be conducted in accordance with "Methods for Organochlorine Pesticides and Chlorophenoxy Acid Herbicides in Drinking Water and Raw Source Water," available from ORD Publications, CERI, EPA, Cincinnati, Ohio 45268; or "Chlorinated Phenoxy Acid Herbicides in Water," Annual Book of ASTM Standards, part 31, Method D-3478-79; or Method 509-B, pp. 565-569 in "Standard Methods for the Examination of Water and Wastewater," 14th Edition; or "Gas Chromatographic Methods for Analysis of Organic Substances in Water," USGS, Book 5, Chapter A-3, pp. 24-39. Copies of these publications are available for inspection at the office of the department of natural resources, the secretary of state's office and the office of the revisor or statutes, and may be obtained for personal use from the U.S. Environmental Protection Agency, Washington, D.C., 20460.

(6) Other analytical methods, if any, approved by the U.S. environmental protection agency are acceptable. The department shall maintain a list of approved methods.

History: Cr. Register, February, 1978, No. 266, eff. 3-1-78; am., Register, April, 1982, No. 318, eff. 5-1-82; am. (4) and (6), Register, December, 1982, No. 324, eff. 1-1-83.

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NR 109.22 Total trihalomethanes — sampling and analytical requirements. (1) The supplier of water for a community water system which serves a population of 10,000 or more individuals and which adds a disinfectant (oxidant) to the water shall analyze for total trihalomethanes (TTHMs) in accordance with this section. For systems serving 75,000 or more individuals, sampling and analyses shall begin not later than March 31, 1981. For systems serving 10,000 to 74,999 individuals, sampling and analyses shall begin not later than March 31, 1983. For the purpose of this section, the minimum number of samples required to be taken by the system shall be based on the number of plants used by the system except that multiple wells drawing raw water from a single aquifer may, with department approval, be considered one plant for determining the minimum number of samples. All samples required during an established monitoring period shall be collected within a 24-hour period.

(2) (a) For all community water systems utilizing surface water sources in whole or in part, and for all community water systems utilizing only groundwater sources that have not been determined by the department to qualify for the monitoring requirements of sub. (3), analyses for TTHMs shall be performed at quarterly intervals on at least 4 water samples for each plant used by the system. At least 25% of the samples shall be taken at locations within the distribution system reflecting the maximum residence time of the water in the system. The remaining 75% shall be taken at representative locations in the distribution system, taking into account the number of persons served, different sources of water and different treatment methods employed. The results of all analyses per quarter shall be arithmetically averaged and reported to the department within 30 days of the system's receipt of such results. All samples collected shall be used in the computation of the average, unless the analytical results are invalidated for technical reasons. Sampling and analyses shall be conducted in accordance with the methods listed in sub. (5).

(b) The monitoring frequency required by par. (a) may be reduced by the department to a minimum of one sample analyzed for TTHMs per quarter taken at a point in the distribution system reflecting the maximum residence time of the water in the system, upon a determination by the department that the data from at least one year of monitoring in accordance with par. (a) and local conditions demonstrate that TTHM concentrations will be consistently below the maximum contaminant level. If at any time during which the reduced monitoring frequency prescribed under this paragraph applies, the results from any analysis exceed 0.10 mg/l of TTHMs and such results are confirmed by at least one check sample taken promptly after such results are received, or if the system makes any significant change to its source of water or treatment program, the supplier of water shall immediately begin monitoring in accordance with the requirements of par. (a), which monitoring shall continue for at least one year before the frequency may be reduced again. At the option of the department, a system's monitoring frequency may be increased above the minimum in those cases where it is necessary to detect variations of TTHM levels within the distribution system.

(3) (a) The supplier of water for a community water system utilizing only groundwater sources may seek to have the monitoring frequency

required by sub. (2) (a) reduced to a minimum of one sample for maximum TTHM potential per year for each plant used by the system, taken at a point in the distribution system reflecting maximum residence time of the water in the system. The supplier of water shall submit to the department the results of at least one sample analyzed for maximum TTHM potential for each plant used by the system, taken at a point in the distribution system reflecting the maximum residence time of the water in the system, taken at a point in the distribution system reflecting the maximum residence time of the water in the system. The system's monitoring frequency may only be reduced upon a determination by the department that, based upon the data submitted by the system, the system has a maximum TTHM potential of less than 0.10 mg/l and that, based upon an assessment of the local conditions of the system, the system is not likely to approach or exceed the maximum contaminant level for total TTHMs. The results of all analyses shall be reported to the department within 30 days of the system's receipt of such results. All samples collected shall be used for determining whether the system must comply with the monitoring requirements of sub. (2), unless the analytical results are invalidated for technical reasons. Sampling and analyses shall be conducted in accordance with the methods listed in sub. (5).

(b) If at any time during which the reduced monitoring frequency prescribed under par. (a) applies, the results from any analysis taken by the supplier of water for maximum TTHM potential are equal to or greater than 0.10 mg/l and such results are confirmed by at least one check sample taken promptly after such results are received, the system shall immediately begin monitoring in accordance with the requirements of sub. (2) and such monitoring shall continue for at least one year before the frequency may be reduced again. In the event of any significant change to the system's raw water or treatment program, the supplier of water shall immediately analyze an additional sample for maximum TTHM potential taken at a point in the distribution system reflecting maximum residence time of the water in the system for the purpose of determining whether the system must comply with the monitoring requirements of sub. (2). At the option of the department, monitoring frequencies may be increased above the minimum in those cases where this is necessary to detect variation of TTHM levels within the distribution system.

(4) Compliance with s. NR 109.20 (3) shall be determined based on a running annual average of quarterly samples collected by the system as prescribed in sub. (2) (a) or (b). If the average of samples covering any 12 month period exceeds the maximum contaminant level, the supplier of water shall report to the department under s. NR 109.80 and notify the public under s. NR 109.81. Monitoring after the maximum contaminant level is exceeded shall be at a frequency designated by the department and shall continue until a monitoring schedule as a condition to a variance, exemption or enforcement action becomes effective.

(5) (a) Sampling and analyses made under this section shall be conducted by one of the following EPA approved methods:

1. "The Analysis of Trihalomethanes in Drinking Waters by the Purge and Trap Method," Method 501.1, EMSL, EPA, Cincinnati, Ohio.

2. "The Analysis of Trihalomethanes in Drinking Water by Liquid/Liquid Extraction," Method 501.2, EMSL, EPA, Cincinnati, Ohio.

Note: The references listed above are contained in 40 CFR s. 141, Appendix C.

(am) Copies of these publications are available for inspection at the office of the department of natural resources, the secretary of state's office and the office of the revisor of statutes, and may be obtained for personal use from the U.S. Environmental Protection Agency, Washington, DC 20460.

(b) Samples for TTHM analysis shall be dechlorinated upon collection to prevent further production of trihalomethanes, according to the procedures described in par. (a) 1. and 2. Samples for maximum TTHM potential should not be dechlorinated, and should be held for 7 days at 25°C (or above) prior to analysis according to the procedures described in par. (a) 1. and 2.

(6) Before the supplier of water for a community water system makes any significant modifications to its existing treatment process for the purposes of achieving compliance with s. NR 109.20 (3), such supplier shall submit and obtain department approval of a detailed plan setting forth its proposed modification and those safeguards that it will implement to ensure that the bacteriological quality of the drinking water provided by such system will not be adversely affected by such modification. Each system shall comply with the provisions set forth in the department approved plan. At a minimum, a department approved plan shall require the supplier of water for a system modifying its disinfection practice to:

(a) Evaluate the water system for sanitary defects and evaluate the source water for biological quality;

(b) Evaluate its existing treatment practices and consider improvements that will minimize disinfectant demand and optimize finished water quality throughout the distribution system;

(c) Provide baseline water quality survey data of the distribution system. Such data shall include the results from monitoring for coliform and fecal coliform bacteria, fecal streptococci, standard plate counts at 35°C and 20°C, phosphate, ammonia nitrogen and total organic carbon. Virus studies may be required where source waters are heavily contaminated with sewage effluent;

(d) Conduct additional monitoring to assure continued maintenance of optimal biological quality in finished water (example: when chloramines are introduced as disinfectants or when pre-chlorination is being discontinued). Additional monitoring may also be required by the department for chlorate, chlorite and chlorine dioxide if chlorine dioxide is approved as a disinfectant. Standard plate count analyses may also be required by the department as appropriate before and after any modifications; and

(e) Include in the plan provisions to maintain an active disinfectant residual throughout the distribution system at all times during and after the modification.

NR 109.30 Maximum microbiological contaminant levels. The following are the maximum contaminant levels for coliform bacteria applicable to community water systems and non-community water systems. Compliance with maximum contaminant levels for coliform bacteria is determined pursuant to NR 109.31 (4) (b) for purposes of public notification requirements pursuant to NR 109.81. The public notification provisions of NR 109.81 shall not apply to sub. (3) or (4).

(1) When the membrane filter technique pursuant to NR 109.31 (1) is used, the number of coliform bacteria shall be less than one per 100 milliliters in any sample collected and analyzed pursuant to NR 109.31 (2) or (3).

(2) When the fermentation tube method and 10 milliliter standard portions under s. NR 109.31 (1) are used, coliform bacteria may not be present in any portion of any sample collected and analyzed under s. NR 109.31 (2) or (3).

(3) The supplier of water shall initiate definitive action to identify the cause of the positive bacteriological sample results and to eliminate potential health hazards which might exist in the system when monitoring pursuant to s. NR 109.31 (2), (3) or (4) shows the presence of any coliform organisms in any of the following:

(a) More than 10% of the samples in any quarter when more than 20 samples are required per quarter; or

(b) Two or more samples in any quarter when 6 to 20 samples are required per quarter; or

(c) Two or more in any year when less than 24 samples are required per year.

(4) Bacterial plate counts on water distributed to the consumer may not exceed 500 organisms per milliliter. When this value is exceeded the department shall determine if the bacterial count is of public health or nuisance significance and may require appropriate action.

History: Cr. Register, February, 1978, No. 266, eff. 3-1-78; am. (2) and (4), Register, April, 1982, No. 316, eff. 5-1-82.

NR 109.31 Microbiological contaminant sampling and analytical requirements. (1) Suppliers of water for community water systems and non-community water systems shall analyze for coliform bacteria for the purpose of determining compliance with NR 109.30. Analyses shall be conducted in accordance with the analytical recommendations set forth in "Standard Methods for the Examination of Water and Wastewater," American Public Health Association, 14th Edition, pp. 913-937, except that a standard sample size shall be employed. Copies of this publication are available for inspection at the office of the department of natural resources, the secretary of state's office and the office of the revisor of statutes, and may be obtained for personal use from the American Public Health Association, 1015 Eighteenth St., N.W., Washington, D.C. The standard sample used in the membrane filter procedure shall be 100 milliliters. The standard sample used in the 5 tube most probable number (MPN) procedure (fermentation tube method) shall be 5 times the standard portion. The standard portion is 10 milliliters as described in NR 109.30 (2). The samples shall be taken at points

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which are representative of the conditions within the distribution system.

(2) (a) The supplier of water for a community water system shall take water samples for coliform determination at regular intervals, and in a number proportionate to the population served by the system. Suppliers required to collect multiple samples each month shall sample at geographically representative locations and on dates evenly spaced during the month. In no event shall the sampling frequency be less than as set forth in the following:

Population served:	Minimum number of samples per month
25 to 1,000 (Not serving a municipality)	1
25 to 1,000 (Serving a municipality)	2
1,001 to 2,500.....	2
2,501 to 3,300.....	3
3,301 to 4,100.....	4
4,101 to 4,900.....	5
4,901 to 5,800.....	6
5,801 to 6,700.....	7
6,701 to 7,600.....	8
7,601 to 8,500.....	9
8,501 to 9,400.....	10
9,401 to 10,300.....	11
10,301 to 11,100.....	12
11,101 to 12,000.....	13
12,001 to 12,900.....	14
12,901 to 13,700.....	15
13,701 to 14,600.....	16
14,601 to 15,500.....	17
15,501 to 16,300.....	18
16,301 to 17,200.....	19
17,201 to 18,100.....	20
18,101 to 18,900.....	21
18,901 to 19,800.....	22
19,801 to 20,700.....	23
20,701 to 21,500.....	24
21,501 to 22,300.....	25
22,301 to 23,200.....	26
23,201 to 24,000.....	27
24,001 to 24,900.....	28
24,901 to 25,000.....	29
25,001 to 28,000.....	30
28,001 to 33,000.....	35
33,001 to 37,000.....	40
37,001 to 41,000.....	45
41,001 to 46,000.....	50
46,001 to 50,000.....	55
50,001 to 54,000.....	60
54,001 to 59,000.....	65
59,001 to 64,000.....	70
64,001 to 70,000.....	75
70,001 to 76,000.....	80
76,001 to 83,000.....	85

83,001 to 90,000.....	90
90,001 to 96,000.....	95
96,001 to 111,000.....	100
111,001 to 130,000.....	110
130,001 to 160,000.....	120
160,001 to 190,000.....	130
190,001 to 220,000.....	140
220,001 to 250,000.....	150
250,001 to 290,000.....	160
290,001 to 320,000.....	170
320,001 to 360,000.....	180
360,001 to 410,000.....	190
410,001 to 450,000.....	200
450,001 to 500,000.....	210
500,001 to 550,000.....	220
550,001 to 600,000.....	230
600,001 to 660,000.....	240
660,001 to 720,000.....	250
720,001 to 780,000.....	260
780,001 to 840,000.....	270
840,001 to 910,000.....	280
910,001 to 970,000.....	290
970,001 to 1,050,000.....	300
1,050,001 to 1,140,000.....	310
1,140,001 to 1,230,000.....	320
1,230,001 to 1,320,000.....	330
1,320,001 to 1,420,000.....	340
1,420,001 to 1,520,000.....	350
1,520,001 to 1,630,000.....	360
1,630,001 to 1,730,000.....	370
1,730,001 to 1,850,000.....	380
1,850,001 to 1,970,000.....	390
1,970,001 to 2,060,000.....	400

(b) Based on a history of no coliform bacterial contamination and on a sanitary survey by the department showing the water system to be supplied solely by a protected ground water source and free of sanitary defects, a non-municipal community water system serving 25 to 1,000 persons may, with written permission from the department, reduce this sampling frequency, except that in no case shall it be reduced to less than one per quarter.

(3) The supplier of water for a non-community school water system shall sample for coliform bacteria in each calendar quarter during which the system provides water to the public, unless the department, on the basis of a sanitary survey, determines that some other frequency is more appropriate.

(4) Based on a history of bacteriologically unsafe samples, structural deficiencies, or affected population, the department may require the supplier of water for a non-community water system to monitor for coliform bacteria at specified intervals.

(5) (a) When a sample collected under sub. (2) or (3) exceeds a maximum contaminant level set forth in s. NR 109.30(1) or (2), the supplier

of water shall collect a repeat sample which shall be considered the check sample from the same sampling point within 48 hours.

(b) When the examination of the check sample required in par. (a) shows the presence of coliform organisms, the supplier of water shall:

1. Report to the department within 48 hours; and
2. Initiate an investigation, including the collection within 48 hours and examination of additional samples from the same point and other sampling points in the area, to define the extent of the problem; and
3. Notify the public in the area affected by the indicated contamination as prescribed in s. NR 109.81 unless the department determines that no health hazard has actually existed.

(c) The department, at its discretion, may require that additional check samples be collected at a specified frequency from the same sampling point and other sampling points in the area and examined to identify and eliminate suspected health hazards when a sample exceeds a maximum contaminant level under s. NR 109.30(1) or (2), even if the check sample required in par. (a) does not indicate the presence of coliform bacteria.

(d) When the cause of the indicated contamination has been determined and corrected, additional samples shall be collected at a frequency directed by the department.

(e) The location at which the sample was taken under par. (a) may not be eliminated from future sampling without approval of the department.

(6) The department may determine that unreliable examination results for a sample collected in a monitoring period under sub. (2) were caused by factors beyond the control of the water supplier. Such factors could be excessive transit time between collection and examination of the sample, samples being broken in transit, or interference in test results when the membrane filter technique is used. If this is the case, another sample collected immediately upon learning of these results may be used in determining compliance with sampling requirements in sub. (2) or (3). However, a single sample may not be attributed to more than one monitoring period.

(7) Check samples, samples with unreliable examination results, and special purpose samples, such as those taken to determine whether disinfection practices following water main placement, replacement, or repair have been sufficient, may not be used to determine compliance with sub. (2) or (3).

(8) In addition to sampling from the distribution system, each supplier of water for a system providing chlorination shall obtain at least one sample every 3 months from each well prior to the point of any chemical addition. For waterworks which have more than one well in the same location and utilizing the same aquifer, only one of the wells must be sampled each time on an alternating basis. If a well has a high potential for contamination, the department may, in individual cases, require more frequent sampling.

(9) At surface water facilities, the bacteriological quality of the water shall be monitored sufficiently to maintain quality control of the treatment process. Each plant shall establish a schedule which will be subject to review and modification by the department.

Note: Generally, membrane filter or 5 tube fermentation tests and plate counts of the raw, settled and finished water on an established schedule will be necessary to meet this requirement.

(10) At all waterworks which have a potential for high total bacteria levels because of the water quality, the method of treatment, chemical addition or other cause, the department may require plate counts pursuant to an established schedule. Analyses shall be conducted in accordance with the analytical recommendations set forth in "Standard Methods for the Examination of Water and Wastewater", American Public Health Association, 14th Edition, pp. 908-913. Copies of this publication are available for inspection at the office of the department of natural resources, the secretary of state's office and the office of the revisor of statutes, and may be obtained for personal use from the American Public Health Association, 1015 Eighteenth St., N.W., Washington, D.C.

History: Cr. Register, February, 1978, No. 266, eff. 3-1-78; am. (2) (a) (intro.) and (b) and (3), renum. (4) to (9) to be (5) to (10) and am. (6) to (9), cr. (4), Register, April, 1982, No. 316, eff. 5-1-82; am. (7), Register, December, 1982, No. 324, eff. 1-1-83.

NR 109.40 Maximum contaminant levels for turbidity. The maximum contaminant levels for turbidity are applicable to both community water systems and non-community water systems using surface water sources in whole or in part. The maximum contaminant levels for turbidity in drinking water, measured at a representative entry point (s) to the distribution system, are:

Note: Water systems governed by ch. NR 112 may not utilize surface water sources.

(1) One nephelometric turbidity unit (NTU), as determined by a monthly average under s. NR 109.41, except that 5 or fewer turbidity units may be allowed if the supplier of water can demonstrate to the department that the higher turbidity does not do any of the following:

- (a) Interfere with disinfection;
- (b) Prevent maintenance of an effective disinfectant agent throughout the distribution system; or
- (c) Interfere with microbiological determinations.

(2) Five nephelometric turbidity units (NTU) based on an average for 2 consecutive days pursuant to NR 109.41.

History: Cr. Register, February, 1978, No. 266, eff. 3-1-78; am. (1) (intro.), Register, April, 1982, No. 316, eff. 5-1-82.

NR 109.41 Turbidity sampling and analytical requirements. (1) The requirements of this section shall apply only to public water systems which use water in whole or in part from surface water sources.

(2) Samples shall be taken by suppliers of water for both community water systems and non-community water systems at representative entry points to the water distribution system at least once per day, for the purpose of making turbidity measurements to determine compliance with s. NR 109.40. The measurement shall be made by the Nephelomet-

ric Method in accordance with the recommendations set forth in "Standard Methods for the Examination of Water and Wastewater", American Public Health Association, 14th Edition, pp. 132-134; or Method 180.1 — Nephelometric Method in "Methods for Chemical Analysis of Water and Waste," EMSL, Cincinnati, EPA, 1979. Copies of these publications are available for inspection at the office of the department of natural resources, the secretary of state's office and the office of the revisor of statutes, and may be obtained for personal use from, respectively, the American Public Health Association, 1015 Eighteenth St., N.W., Washington, D.C. and the U.S. Environmental Protection Agency, Washington, D.C. 20460.

(3) If the result of a turbidity analysis exceeds the maximum contaminant level, the sampling and measurement shall be confirmed by resampling as soon as practicable and preferably within one hour. If the repeat sample confirms that the maximum contaminant level has been exceeded, the supplier of water shall report to the department within 48 hours. The repeat sample shall be the sample used for the purpose of calculating the monthly average. If the monthly average of the daily samples exceeds the maximum contaminant level, or if the average of 2 samples taken on consecutive days exceeds 5 NTU, the supplier of water shall report to the department and notify the public as directed in ss. NR 109.80 and 109.81.

History: Cr. Register, February, 1978, No. 266, eff. 3-1-78; am. (2) and (3), r. (4), Register, April, 1982, No. 316, eff. 5-1-82; am. (2), Register, December, 1982, No. 324, eff. 1-1-83.

NR 109.50 Maximum contaminant levels for radium-226, radium-228, and gross alpha particle radioactivity in community water systems. The following are the maximum contaminant levels for radium-226, radium-228, and gross alpha particle radioactivity:

- (1) Combined radium-226 and radium-228 — 5 pCi/l.
- (2) Gross alpha particle activity (including radium-226 but excluding radon and uranium) — 15 pCi/l.

Note: Sections NR 109.50 through NR 109.52 are identical to the radioactivity standards of the department of health and social services in ch. HSS 157, Wis. Adm. Code, and to the National Interim Primary Drinking Water Regulations, 40 Code of Federal Regulations 141. These sections are adopted pursuant to s. 140.56(2), Stats.

History: Cr. Register, February, 1978, No. 266, eff. 3-1-78.

NR 109.51 Maximum contaminant levels for beta particle and photon radioactivity from man-made radionuclides in community water systems. (1) The average annual concentration of beta particle and photon radioactivity from man-made radionuclides in drinking water shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem/year.

(2) Except for the radionuclides listed in Table A, the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents shall be calculated on the basis of a 2 liter per day drinking water intake using the 168 hour data listed in "Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air or Water for Occupational Exposure", NBS Handbook 69 as amended August, 1963, U.S. Department of Commerce. Copies of this document are available for inspection at the office of the

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department of natural resources, the secretary of state's office and the office of the revisor of statutes, and may be obtained for personal use from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. If 2 or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ shall not exceed 4 millirem/year.

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