ENVIRONMENTAL PROTECTION

WATER RESOURCE MANAGEMENT

DIVISION OF WATER MONITORING, STANDARDS AND PESTICIDE CONTROL

Ground Water Quality Standards

Remediation Standards

Proposed Amendments: N.J.A.C. 7:9C-1.7, 1.9, and 7:9C Appendix Table 1; and 7:26D-7.2

Authorized By: Shawn M. LaTourette, Commissioner, Department of Environmental Protection.

Authority: N.J.S.A. 13:1D-1 et seq., 58:10A-1 et seq., and 58:11A-1 et seq.

Calendar Reference: See Summary below for explanation of exception to calendar requirement.

DEP Docket Number: 04-23-11.

Proposal Number: PRN 2024-006.

A **public hearing** concerning this notice of proposal will be held on January 30, 2024, at 10:00 A.M.

The hearing will be conducted virtually through the Department of Environmental Protection's (Department) video conferencing software, Microsoft Teams. A link to the virtual public hearing will be provided on the Department's website at https://dep.nj.gov/rules/notice-of-rule-proposals/.

If you are interested in providing oral testimony or submitting written comments at the virtual public hearing, please email the Department at gwqs@dep.nj.gov no later than 5:00 P.M. on January 26, 2024, with your contact information (name, organization, telephone number, and email address). You must provide a valid email address, so the Department can send you an email confirming receipt of your interest to testify orally at the hearing and provide you with a separate

option for a telephone call-in line if you do not have access to a computer that can connect to Microsoft Teams. Please note that the Department will take oral testimony at the hearing in alphabetical order of the testifying person's last name. Further, this hearing will be recorded. It is requested (but not required) that anyone providing oral testimony at the public hearing provide a copy of any prepared remarks to the Department through email.

Further information on the public hearing will be posted on the Department's website at https://dep.nj.gov/rules/notice-of-rule-proposals/ at least 15 days prior to the date of the hearing. Notice will also be sent to those who have subscribed to the Department's rulemaking listserv. To subscribe, go to https://dep.nj.gov/rules/receive-rule-proposal-notices-via-email/.

Written comments may also be submitted at the public hearing. It is requested (but not required) that anyone who testifies at the public hearing provide a copy of their comments to the stenographer at the hearing.

Submit comments by close of business on March 2, 2024, electronically at http://www.nj.gov/dep/rules/comments. Each comment should be identified by applicable N.J.A.C. citation, with the commenter's name and affiliation following the comment. The Department encourages electronic submittal of comments. In the alternative, comments may be submitted on paper to:

Stephanie J. Press, Esq.

Attn.: DEP Docket No. 04-23-11

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This rule proposal, as well as a Basis and Background document containing technical detail in support of the proposed amendments, may be viewed or downloaded from the Department's website at https://dep.nj.gov/rules/.

The agency proposal follows:

Summary

As the Department has provided a 60-day comment period on this notice of proposal, this notice is excepted from the rulemaking calendar requirement pursuant to N.J.A.C. 1:30-3.3(a)5.

The New Jersey Water Pollution Control Act (Act) at N.J.S.A. 58:10A-4 authorizes the Department to adopt and enforce the Ground Water Quality Standards (GWQS). The GWQS, N.J.A.C. 7:9C, establish the designated uses of the State's ground waters, classify ground waters based on those uses, and specify the water quality standards, criteria, and other policies and provisions necessary to support those designated uses. The GWQS are not self-executing, but are implemented by various Department regulatory programs to achieve the policy of the Act, which is "to restore, enhance and maintain the chemical, physical, and biological integrity of its waters, to protect public health, to safeguard fish and aquatic life and scenic and ecological values, and to

enhance the domestic, municipal, recreational, industrial and other uses of water" (N.J.S.A. 58:10A-2). Specifically, the GWQS are used to develop ground water quality protection standards for New Jersey Pollutant Discharge Elimination System (NJPDES) discharge to ground water permits pursuant to N.J.A.C. 7:14A, and as the remediation standards for the cleanup of ground water contamination sites pursuant to N.J.A.C. 7:26D and 7:26E. The GWQS may also be applied through other programs that administer the Spill Compensation and Control Act (N.J.S.A. 58:10-23.11 et seq.), the Brownfield and Contaminated Site Remediation Act (N.J.S.A. 58:10B-1 et seq.), the Solid Waste Management Act (N.J.S.A. 13:1E-l et seq.), the Industrial Site Recovery Act (N.J.S.A. 13:1K-6 et seq.), the Underground Storage of Hazardous Substances Act (N.J.S.A. 58:10A-21), the Realty Improvement Sewerage Facilities Act (N.J.S.A. 58:11-23 et seq.), and the Pesticide Control Act of 1971 (N.J.S.A. 13:1F-1 et seq.).

As is explained in further detail below, the GWQS include ground water quality criteria and practical quantitation levels (PQLs) for Class II-A waters. The ground water quality criteria are the designated levels or concentrations of constituents that, when exceeded, will prohibit or significantly impair a designated use of water (N.J.A.C. 7:9C-1.4). The PQL is the lowest concentration of a constituent that can be reliably achieved among laboratories within specified limits of precision and accuracy during routine laboratory operating conditions (N.J.A.C. 7:9C-1.4). In general, the ground water quality criteria must be met unless the PQL for a constituent is greater than the ground water quality criterion, in which case the PQL must be met.

The Department is proposing to amend the GWQS to update the specific ground water quality criteria and/or PQLs for 73 constituents of Class II-A ground water based on United States

Environmental Protection Agency (USEPA) methodologies and the best available scientific information. These proposed updates will result in changes to the constituent standards (ground water quality standards) for 65 of the 73 constituents. Of these 65 proposed ground water quality standards, 50 will become more stringent, 13 will become less stringent, and two are for constituents that currently have interim generic ground water quality criteria. The two interim generic criteria will be replaced with specific ground water quality criteria pursuant to N.J.A.C. 7:9C-1.7(c)3ii. The proposed standards for these two constituents will be less stringent than the current interim generic criteria. The proposed criteria updates for an additional eight constituents remain lower than their PQLs, resulting in no updates to the ground water quality standards for those constituents.

In addition, the Department is proposing to add language at N.J.A.C. 7:9C-1.7(c)3i to enable the Department to update the specific ground water quality criterion for a constituent with a corresponding Maximum Contaminant Level (MCL) in the Safe Drinking Water Act (SDWA) rules, N.J.A.C. 7:10, when the Department determines that the weight of evidence approach specified at N.J.A.C. 7:9C-1.7(c)3ii would appropriately address the risk posed by the constituent than the risk addressed by the health-based level used to establish the MCL. The Department is also proposing to amend the default values for body weight and drinking water consumption rate at N.J.A.C. 7:9C-1.7(c)4i and ii to be consistent with the USEPA Final Updated Ambient Water Quality Criteria for the Protection of Human Health (EPA-HQ-OW-2014-0135; FRL-9929-85-OW) published in the Federal Register on June 29, 2015, at https://www.federalregister.gov/documents/2015/06/29/2015-15912/final-updated-ambient-

water-quality-criteria-for-the-protection-of-human-health. Additionally, the Department is proposing amendments to the rounding provisions at N.J.A.C. 7:9C-1.7(c)4iii and 1.9(c)3i to round new or revised ground water quality criteria and PQLs to two significant figures, rather than one, when scientifically supportable, to be consistent with the rounding protocols employed for other environmental standards promulgated by the Department.

Lastly, the Department is proposing to amend the Remediation Standards at N.J.A.C. 7:26D-7.2(b) to reference N.J.A.C. 7:9C-1.7(c), instead of (c)5. This will allow the Department to update the "companion" remediation standard when it modifies or adds a ground water quality criterion to Appendix Table 1 through either a rulemaking or notice of administrative change.

The Department conducted a stakeholder meeting for this rulemaking on May 28, 2019, in the Department's Public Hearing Room. Fourteen external stakeholders attended the meeting, representing a range of interests including Licensed Site Remediation Professionals (LSRPs) and other consultancies, commercial laboratories, local government, environmental organizations, academia, and the Highlands Council. Most of these stakeholders were involved in the previous GWQS stakeholder process convened in 2016 and 2017.

Background

The GWQS at N.J.A.C. 7:9C designate uses for all ground waters of the State, classify ground waters based on the designated uses, and specify the ground water quality criteria that are necessary to support those uses. The classifications of ground waters of the State are established at N.J.A.C. 7:9C-1.5 and are as follows: Class I Ground Water of Special Ecological Significance,

Class II Ground Water for Potable Water Supply, and Class III Ground Water for Uses Other Than Potable Water Supply. Each Class has subclasses that establish primary and secondary designated uses of the ground water and corresponding ground water quality criteria. This proposed rulemaking is only for Class II-A ground water, for which the designated primary use is potable water supply (N.J.A.C. 7:9C-1.5(e)1). Secondary uses for Class II-A ground water include agricultural water and industrial water (N.J.A.C. 7:9C-1.5(e)1). See Table 1 below for a description of all ground water classifications and the corresponding rule citations.

Table 1. Ground water classifications and corresponding rule citations.

N.J.A.C. 7:9C-1.5(d)	**Class I** Ground Water of Special Ecological Significance ▪ **Primary Designated Use:** Maintenance of special ecological resources
	Class 1-A – Exceptional Ecological Areas (1) Watersheds of FW1 surface waters. (2) The Natural Areas as designated by the Department pursuant to N.J.A.C. 7:5A-1.13. **Ground Water Quality Criteria:** natural quality = nondegradation (N.J.A.C. 7:9C-1.7(a))
	Class I-PL – Pinelands (Preservation Area) **Ground Water Quality Criteria**: natural quality = nondegradation (N.J.A.C. 7:9C-1.7(b)1)
	Class I-PL – Pinelands (Protection Area)

	Ground Water Quality Criteria: background quality (N.J.A.C 7:9C-1.7(b)2)
N.J.A.C. 7:9C-1.5(e)	**Class II** Ground Water for Portable Water Supply ▪ **Primary Designated Use:** Existing and potential potable water supply
	Class II-A – Currently potable with conventional treatment. All ground water of the State, except for ground water designated in Classes I, II-B or III. **Ground Water Quality Criteria**: Human health-based numeric criteria. N.J.A.C. 7.9C-1.7(c) describes the process, including equations, for deriving human health-based criteria based on assessment of risk via the consumption pathway. Higher of criterion and PQL = ground water quality standard; listed in Appendix Table 1.
	Class II-B – Potable subsequent to enhancement or restoration of regional water quality (no Class II-B have ever been designated) **Ground Water Quality Critera**: Same as Class II-A criteria
N.J.A.C. 7:9C-1.5(f)	**Class III** Ground Water With Uses Other Than Potable Water Supply (due to natural hydrogeological characteristics or natural water quality) ▪ **Primary Designated Use:** ▪ Class III-A: Transmittal of ground water to adjacent classification areas and surface water. ▪ Class III-B: Any reasonable use other than potable water
	Class III-A – Ground water in aquitards (described at N.J.A.C. 7:9C-1.5(f)1) **Ground Water Quality Criteria**: Varies depending on where the water is released or transmitted. Criteria are that of the most stringent adjacent classification area unless there is no potential for pollutant migration (N.J.A.C. 7:9C-1.7(e)).

	Class III-B – Non-potable including saltwater intrusion (described at N.J.A.C. 7:9C-1.5(f)3) **Ground Water Quality Criteria:** "determined on an area by area basis in response to case by case needs"; no impairment to existing uses of ground and surface waters (N.J.A.C. 7:9C-1.7(f)).

There are three types of numeric criteria for Class II-A ground water: specific, interim specific, and interim generic. The Department currently establishes specific and interim specific ground water quality criteria for ground water constituents in two ways, pursuant to N.J.A.C. 7:9C-1.7(c)3i and ii: (1) where an MCL for a constituent is promulgated in the SDWA rules at N.J.A.C. 7:10, the health-based level used to establish the MCL is the specific ground water quality criterion for that constituent; and (2) for all other constituents, the Department develops ground water quality criteria based on the weight of evidence available regarding the particular constituent's carcinogenicity, toxicity, public welfare, or organoleptic effects, as appropriate for the protection of potable water, according to the equations, data sources, and conventions at N.J.A.C. 7:9C-1.7(c)4. The proposed amendments at N.J.A.C. 7:9C-1.7(c)3 and 4 will affect the derivation of interim specific and specific ground water quality criteria. For Synthetic Organic Chemicals (SOCs) not listed at N.J.A.C. 7:9C Appendix Table 1, interim generic criteria at N.J.A.C. 7:9C Appendix Table 2 apply until an interim specific criterion is developed or a specific criterion is promulgated.

A corresponding PQL Is also derived for each interim specific and specific Class II-A ground water quality criterion, as appropriate. The PQL reflects the analytical constraints on measuring the constituent concentration in ground water. The Department establishes PQLs based on the lowest concentration of a constituent that can be reliably quantified among laboratories within specified limits of precision and accuracy during routine laboratory operating conditions.“"Specified limits of precision and accurac”" are the criteria that have been included in applicable regulations including, but not limited to, those regulations listed at N.J.A.C. 7:9C-1.9 or listed in the calibration specifications or quality control specifications of an analytical method (N.J.A.C. 7:9C-1.4).

Appendix Table 1 of the GWQS lists all the specific ground water quality criteria, PQLs, ground water quality standards, and unique numerical identifiers known as Chemical Abstracts Service Registry Numbers (CASRNs) for constituents in Class II-A ground water. Specific ground water quality criteria (derived in accordance with N.J.A.C. 7:9C-1.7(c)4) and PQLs (derived in accordance with N.J.A.C. 7:9C-1.9(c)3) are expressed in micrograms per liter (µg/L). For each constituent, the higher, or less stringent, of the PQL and the specific ground water quality criterion is the applicable ground water quality standard, in accordance with N.J.A.C. 7:9C-1.9(c).

Specific Ground Water Quality Criteria, PQLs and Standards for Constituents in Class II-A Ground Water at Appendix Table 1

Between 2016 and 2017, the Department identified constituents from Appendix Table 1 for which updated human health data were available and evaluated the scientific basis of the

specific ground water quality criteria for these constituents to ensure that the human health criteria reflects the best available scientific information as of 2017. Information relevant to improved analytical capabilities for constituents from Appendix Table 1 was reviewed through 2020. Based on these reviews, the Department is proposing to update the specific ground water quality criteria and/or PQLs for 73 constituents in Appendix Table 1. These include updates to 53 ground water quality criteria and 39 PQLs. As stated above, in accordance with N.J.A.C. 7:9C-1.9, a constituent's ground water quality standard is either the PQL or the specific ground water quality criterion, whichever is higher. The proposed criteria and PQL updates will result in changes to the ground water quality standards for 65 of the 73 constituents, with the remaining eight constituents having no change to the ground water quality standard. Of these 65 ground water quality standards, 50 will become more stringent, 13 will become less stringent, and two are new specific standards for constituents that currently have interim generic criteria. The Basis and Background document for this notice of proposal is available from the Department's website (https://nj.gov/dep/wms/bears/support_docs.htm#gwqs) and explains the sources and derivations of these updates.

The ground water quality standards for seven of the 65 constituents will become more stringent by one or more orders of magnitude, which will trigger the "order of magnitude" provisions of the Brownfield and Contaminated Site Act, N.J.S.A. 58:10B-12(j) and 13(e). These provisions may require persons responsible for conducting the remediation of a contaminated site to conduct additional remediation. These seven constituents are 1,1-biphenyl; cobalt; cyanide

(free); 1,3-dichlorobenzene (meta); heptachlor epoxide; methoxychlor; and vinyl chloride (see Table 2).

Table 2. Constituents with a proposed ground water quality standard that is one or more orders of magnitude more stringent than the current ground water quality standard

Constituent	**CASRN**	**Current Ground Water Quality Standard***	**Proposed Ground Water Quality Standard***
1,1 biphenyl	92-52-4	400	5.0
Cobalt	7440-48-4	100	2
Cyanide (free)	57-12-5	100	5.0
1,3-dichlorobenzene (meta)	541-73-1	600	5
Heptachlor epoxide	1024-57-3	0.2	0.020
Methoxychlor	72-43-5	40	0.1
Vinyl chloride	75-01-4	1	0.035

*expressed as micrograms per liter (µg/L)

N.J.A.C. 7:9C-1.7(c)3: Relationship between MCLs, specific criteria, and interim specific criteria

The Department is proposing to add language at N.J.A.C. 7:9C-1.7(c)3i to enable the Department to update the specific ground water quality criterion for a constituent with an MCL when the Department determines that the weight of evidence approach specified at N.J.A.C. 7:9C-

1.7(c)3ii would more appropriately address the risk posed by the constituent than the health-based level used to establish the MCL.

The Department currently establishes specific and interim specific ground water quality criteria for ground water constituents in two ways, pursuant to N.J.A.C. 7:9C-1.7(c)3: (1) where an MCL for a constituent is promulgated in the SDWA rules at N.J.A.C. 7:10, the health-based level used to establish the MCL is the specific ground water quality criterion for that constituent; and (2) for all other constituents, the Department develops ground water quality criteria based on the weight of evidence available regarding the particular constituent's carcinogenicity, toxicity, public welfare, or organoleptic effects, as appropriate, for the protection of potable water, according to the equations, data sources, and conventions at N.J.A.C. 7:9C-1.7©4.

This amendment will enable the Department to develop ground water quality criteria, even for constituents that have a previously promulgated MCL, based upon the weight of evidence approach specified at N.J.A.C. 7:9C-1.7(c)3ii for the protection of potable water. In determining whether a criterion derived in accordance wi©(c)3ii would more appropriately address the risk posed by the constituent, the Department would review constituent-specific data, applicable USEPA guidance, generally accepted scientific evidence, and/or peer reviewed sources of information. The derived criterion that most appropriately addresses the risk may be more or less stringent than the health-based MCL.

The Department makes every effort to update health-based ingestion standards concurrently, where appropriate; however, concurrent updates to MCLs and ground water quality standards are not always possible or necessary. The GWQS, N.J.A.C. 7:9C, are implemented as

ground water discharge limitations at either the point of discharge or at the property boundary pursuant to the NJPDES rule at N.J.A.C. 7:14A, and by the Site Remediation and Waste Management Program as the remediation standards for the cleanup of ground water contamination sites pursuant to N.J.A.C. 7:26D and 26E. Therefore, ground water quality standards can be updated for constituents that are found in ground water discharges or at contaminated sites but that may not be present in drinking water. In these cases, the MCLs may not need to be concurrently updated. It is critical that the standards utilized in the Department's permitting actions and in cleanups reflect the best available science because of the vital economic and public health importance of the State's ground water resources and the protection these programs provide for those resources. The Department's review of the best available science considers the weight of evidence described above and at N.J.A.C. 7:©1.7(c)3ii. The proposed amendments at N.J.A.C. 7:9C-1.7(c)3 will help ensure that the GWQS continue to provide that level of protection.

N.J.A.C. 7:9C-1.7(c)4: Default body weight and drinking water consumption values

The Department is proposing to update the default value for average adult weight from 70 kilograms (kg) (approximately 154 pounds) to 80.0 kg (approximately 176 pounds) and the default value for assumed daily water consumption from two liters per day (L/day) (approximately 68 ounces/day) to 2.4 L/day (approximately 81 ounces/day) at N.J.A.C. 7:9C-1.7(c)4i and ii to be consistent with the USEPA Final Updated Ambient Water Quality Criteria for the Protection of Human Health (EPA-HQ-OW-2014-0135; FRL-9929-85-OW) published in the Federal Register at 80 Fed. Reg. 36986 on June 29, 2015. These updated values will be used as default values in

the development of new or revised specific and interim specific ground water quality criteria that are derived at N.J.A.C. 7:9C-1.7(c)4i and ii, including these proposed amendments to Appendix Table 1. The existing and proposed default values are displayed below (Table 3).

Table 3. Existing and proposed default values for equations at N.J.A.C. 7:9C-1.7(c)4i and ii

Exposure Factor	**Existing Value**	**Proposed Value**
Average body weight (kg)	70	80.0
Average drinking water intake (L/day)	2	2.4

In 2015, the USEPA updated its national recommended water quality criteria for human health to reflect the latest scientific information and policies. Updates relevant to the development of ground water criteria included updated default values for body weight and drinking water intake, toxicity values, and relative source contribution factors. Specifically, the 2015 recommendations include updated default drinking water exposure assumptions of 80.0 kg for average adult weight and 2.4 L/day for average adult water consumption, which replaced the prior values of 70 kg and two L/day, respectively, from the USEPA (2000b) guidance. The USEPA updated the default body weight for deriving human health criteria from 70 to 80.0 kg based on National Health and Nutrition Examination Survey (NHANES) data from 1999 to 2006 (Exposure Factors Handbook: 2011 Edition. EPA-600-R-09-052F, https://www.epa.gov/sites/default/files/2015-09/documents/efh-frontmatter.pdf). The USEPA's previously recommended default body weight of 70 kg was based on the mean body weight of adults from the NHANES III database (1988-1994). The updated default drinking water consumption rate of 2.4 L/day is based on NHANES

data from 2003 to 2006 and represents the per capita estimate of community water ingestion at the 90th percentile for adults ages 21 and older. Previously, the USEPA recommended a default drinking water ingestion rate at the 86th percentile for adults surveyed in the U.S. Department of Agriculture's 1994-1996 Continuing Survey of Food Intake by Individuals analysis and the 88th percentile of adults in the National Cancer Institute study of the 1977-1978 Nationwide Food Consumption Survey. The Department generally uses exposure assumptions recommended by the USEPA. The updated USEPA assumption for drinking water ingestion of 2.4 L/day is based on a more recent study from 2003 to 2006 than the previous assumption of two L/day, which is based on studies from 1977-1978 and 1994-1996. The percentiles used for the updated assumption (90th) and previous assumption (86th and 88th) are considered to be essentially equivalent.

Rounding Clauses and Significant Figures at N.J.A.C. 7:9C-1.7(c)4iii©d 1.9(c)3i

The Department is proposing amendments to the rounding clauses at N.J.A© 7:9C-1.7©4iii and 1.9(c)3i to round new or revised interim specific and specific ground water quality criteria and PQLs to two significant figures rather than one, as appropriate, based on the number of significant figures in the toxicity factors and the exposure factors used to derive them. Conventions for determining significant figures and rounding are often applied to environmental standards to establish the degree of confidence in the accuracy of a given number. Rounding of ground water quality criteria and PQLs follows the general scientific practice of dropping digits that are not significant, as recommended by the USEPA 2000 Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (USEPA 2000b). If the digit "6," "7," "8," or

"9" is dropped, the preceding digit is increased by one; if the digit "0," "1," "2," "3," or "4" is dropped, the preceding digit remains the same. If the digit "5" is dropped, then the preceding digit is rounded to the nearest even number (USEPA 2000b). For example, 2.25 would become 2.2, and 2.35 would become 2.4.

Criteria would be expressed in two significant figures when all factors (toxicity factor and exposure assumptions) of the criteria equation are available in two or more significant figures; otherwise, the final criteria will be rounded to one significant figure. Uncertainty factors, relative source contribution factors, cancer risk levels, and conversion factors do not inform the final number of significant figures in the criteria. This approach is consistent with that used by the USEPA for their 2015 update to the Human Health Criteria. Specifically, factors including body weight, drinking water intake, and relative source contribution (for non-carcinogens) are generally reported as two significant figures. However, for some substances, toxicity factors (that is, cancer slope factor (also called a carcinogenic slope factor) for carcinogens, and reference dose (RfD) for non-carcinogens) are available as one significant figure. In such cases, the Department ascertained whether a two significant figure toxicity factor could be derived for that substance. For example, the Department determined whether the derivation of a one significant figure RfD was based on a point of departure reported as two significant figures, and if it was, then applied the original uncertainty factors to derive a two significant figure RfD.

As the ground water quality standard is the greater of the ground water quality criterion and the PQL, new or updated ground water quality standards will also be expressed in two significant figures, when the scientific data allow. The use of two significant figures is consistent

with the Surface Water Quality Standards, N.J.A.C. 7:9B, and the Remediation Standards, N.J.A.C. 7:26D, for constituents with a numeric standard of 10 mg/kg or higher. The rounding to two significant figures when scientifically supportable will be applied to all new or revised ground water quality criteria and PQLs, including the proposed updates.

Derivation of Criteria and Basis for Alternative Values

The Department uses the equations, data sources, and conventions at N.J.A.C. 7:9C-1.7(c)4 as defaults to derive interim specific or specific ground water quality criteria for Class II-A constituents. These equations are displayed below (Equations 1 and 2) and incorporate chemical-specific or default approaches, toxicity factors (a cancer slope factor or RfD), and exposure assumptions, as appropriate.

Equation 1. Default equation used for the derivation of interim specific and specific ground water quality criteria for Class II-A constituents classified as carcinogens. All units noted below, except for the Upper Bound Lifetime Excess Cancer risk of 1×10^{-6} which is unitless. (N.J.A.C. 7:9C-1.7(c)4i)

$$\text{Criterion } (\mu g/L) = \frac{\text{Upper Bound Lifetime Excess Cancer Risk} \times \text{Average Adult Weight} \times \text{Conversion Factor}}{}$$

Carcinogenic Slope Factor x Assumed Daily Water Consumption

Where the default values are:

Average Adult Weight	=	70 kg
Assumed Daily Water Consumption	=	2 liters per day
Upper Bound Lifetime Excess Cancer Risk	=	1×10^{-6}
Conversion Factor	=	1,000 µg/mg
Carcinogenic Slope Factor	=	Value from the United States Environmental Protection Agency (USEPA) Integrated Risk Information System (IRIS) data base, http://www.epa.gov/iris, incorporated herein by reference, as $(mg/kg/data)^{-1}$

Equation 2. Default equation used for the derivation of interim specific and specific ground water quality criteria for Class II-A constituents classified as non-carcinogens. (N.J.A.C. 7:9C-1.7(c)4ii)

Reference Dose x Conversion Factor x Relative Source Contribution

$$\text{Criterion } (\mu g/L) = \frac{\text{Average Adult Weight}}{\text{Assumed Daily Water Consumption} \times \text{Uncertainty Factor}}$$

Where the default values are:

Average Adult Weight	=	70 kg
Relative Source Contribution	=	20 percent
Assumed Daily Water Consumption	=	2 liters per day
Conversion Factor	=	1,000 µg/mg
Reference Dose	=	Value from the United States Environmental Protection Agency (USEPA) Integrated Risk Information System (IRIS) data base, http://www.epa.gov/iris, incorporated herein by reference, as mg/kg/data

Uncertainty Factor	=	10 for carcinogens for which no carcinogenic slope factor is applicable; 1 for non-carcinogens

The GWQS assign default values to the variables used in these equations at N.J.A.C. 7:9C-1.7(c)4i and ii. These variables are the components of the exposure assumption (average adult body weight and assumed daily water consumption); upper bound lifetime excess cancer risk, if the constituent is classified as a carcinogen; and relative source contribution, if the constituent is classified as a non-carcinogen or a carcinogen for which no cancer slope factor is applicable. In Equations 1 and 2, the toxicity of the constituent is accounted for with the toxicity factor, which is either a cancer slope factor (also known as a cancer potency factor) for carcinogens in Equation 1 or an RfD for non-carcinogens or carcinogens for which no cancer slope factor is applicable in Equation 2. The definitions of cancer slope factor and reference dose are available at the USEPA's Integrated Risk Information System (IRIS) glossary (https://sor.epa.gov/sor_internet/registry/termreg/searchandretrieve/termsandacronyms/search.do). If the constituent is classified as a carcinogen for which no cancer slope factor is applicable, the default approach is to include an uncertainty factor of 10 in the denominator of Equation 2. For both equations, the default source of toxicity factors for contaminants is the IRIS database.

However, the Department may use alternative values to the variables in the equations derived by other Federal, state, or international environmental or health agencies or modify the toxicity factors provided by IRIS when the Department determines, based on constituent-specific

data, applicable USEPA guidance, generally accepted scientific evidence and methodologies, and/or peer-reviewed sources of information, that use of an alternative value is more suitable than a default value. When toxicity factors are not available, or when the Department concludes that toxicity factors from IRIS or other sources are outdated or not scientifically supportable, as described above, the Department may derive toxicity factors using the best available scientific literature. In accordance with N.J.A.C. 7:9C-1.7(c)4iv, the Department may use a more suitable, alternative toxicity factor as described above and explain the basis for using the alternative value(s).

Additionally, in accordance with N.J.A.C. 7:9C-1.7(c)4v, if the Department determines, based on constituent-specific data, applicable USEPA guidance, generally accepted scientific evidence and methodologies, and/or peer-reviewed sources of information, that the use of a modified equation is more suitable, the Department may derive a criterion using a modified equation instead of Equation 1 or Equation 2 and explain the basis for using the modified equation.

For this rulemaking, updates to the ground water quality criteria for 29 constituents were derived using alternative toxicity factors, the basis for which is explained below for each constituent. The Basis and Background document includes additional general background on alternative values and uncertainty factors that the Department considers in deriving ground water quality criteria.

Benzene (71-43-2)

Utilizing the USEPA's 1996 Proposed Guidelines for Carcinogen Risk Assessment (USEPA 1996), the USEPA classified benzene as Group A, "known/likely human carcinogen" in

2000 (USEPA 2000a). The existing ground water criterion for benzene is based on a cancer slope factor from a health-based MCL developed by the New Jersey Drinking Water Quality Institute (NJDWQI 1987a). This cancer slope factor of 0.23 $(mg/kg/day)^{-1}$ is based on the 95th percentile upper confidence limit of linear mathematical modeling of leukemia mortality data and benzene exposure in three pooled worker cohort studies as discussed in NJDWQI (1987a).

A 2000 IRIS assessment for benzene derived a cancer slope factor range of 0.015 to 0.055 $(mg/kg/day)^{-1}$ (USEPA 2000a) based on two different exposure assessments (that is, one based on worst-case assumptions and the other based on more likely assumptions) for an updated follow-up evaluation of leukemia mortality in the same cohort of individuals with occupational exposure to benzene used by NJDWQI (1987a). These USEPA (2000a) IRIS slope factors are based on an assessment of cancer risk from the updated follow-up data presented in USEPA (1998) and inhalation-to-oral extrapolation for cancer risk from benzene presented in USEPA (1999a). The 2000 IRIS cancer slope factors are based on the maximum likelihood estimate (that is, the central tendency estimate) of the slope of the modeled data. However, use of the central tendency estimate of the slope is contrary to the USEPA cancer risk assessment guidance (USEPA 2005b), which recommends the use of the 95th percentile upper confidence limit when developing a cancer slope factor based on epidemiological data that is outside of the exposure range.

The NJDWQI (2009) updated its assessment of benzene based on a more stringent cancer slope factor of 0.28 $(mg/kg/day)^{-1}$. The NJDWQI slope factor is based on the same updated follow-up of the exposed workers and inhalation-to-oral extrapolation used by IRIS (USEPA 2000a). However, NJDWQI (2009) used the 95th percentile upper confidence limit of the slope factor, as

recommended by the USEPA (2005b) cancer risk assessment guidance, instead of the less stringent maximum likelihood (central tendency) estimate used by IRIS (USEPA 2000a). Based on this updated cancer slope factor of 0.28 $(mg/kg/day)^{-1}$, the Department is proposing to revise the criterion from 0.2 µg/L to 0.12 µg/L.

Bromodichloromethane (Dichlorobromomethane) (75-27-4)

Utilizing the USEPA's 1999 Review Draft Guidelines for Carcinogen Risk Assessment (USEPA 1999), the USEPA classified bromodichloromethane as "likely to be carcinogenic to humans" by the oral route in 2005 (USEPA 2005a). The existing criterion for bromodichloromethane is based on a cancer slope factor of 0.062 $(mg/kg/day)^{-1}$, which, is in turn, based on kidney tumors in male mice, derived in a 1992 IRIS assessment (USEPA 1992a).

Using the same tumor data as the 1992 IRIS assessment and more current carcinogen risk assessment approaches, the USEPA (2005a) developed a cancer slope factor of 0.034 $(mg/kg/day)^{-1}$. Based on this updated cancer slope factor, which is based on more current risk assessment approaches, the Department is proposing to revise the criterion from 0.6 µg/L to 0.98 µg/L.

Bromoform (75-25-2)

Utilizing the USEPA's 1986 Guidelines for Carcinogen Risk Assessment (USEPA 1986a), the USEPA classified bromoform as Group B2, "probable human carcinogen" in 1990 (USEPA 1990a). The existing criterion for bromoform is based on increased incidence of tumors of the large intestine in female rats, which was used by the USEPA's IRIS program to derive a cancer slope factor of 0.0079 $(mg/kg/day)^{-1}$ (USEPA 1990a).

Using the same tumor data as IRIS, but more current carcinogen risk assessment approaches, the USEPA (2005a) developed a cancer slope factor of 0.0045 $(mg/kg/day)^{-1}$. Based on this updated cancer slope factor, which is based on more current risk assessment approaches, the Department is proposing to revise the criterion from 4 µg/L to 7.4 µg/L.

Butyl benzyl phthalate (85-68-7)

Utilizing the USEPA's 1986 Guidelines for Carcinogen Risk Assessment (USEPA 1986a), the USEPA classified butyl benzyl phthalate as Group C, "possible human carcinogen" in 1989 (USEPA 1989a). The existing criterion for butyl benzyl phthalate is based on an RfD of 0.2 mg/kg/day from a 1989 IRIS assessment, with an additional uncertainty factor of 10 based on the Department's policy for contaminants with evidence of human carcinogenic potential in the absence of an appropriate cancer slope factor.

In 2002, the USEPA developed a Provisional Peer-Reviewed Toxicity Value (PPRTV) for butyl benzyl phthalate that includes a cancer slope factor (USEPA 2002b). Based on the observation of pancreatic tumors in male rats following chronic dietary exposure to butyl benzyl phthalate, the USEPA derived a cancer slope factor of 0.0019 $(mg/kg/day)^{-1}$. Based on this updated cancer slope factor, the Department is proposing to revise the criterion from 100 µg/L to 18 µg/L.

Cadmium (7440-43-9)

The USEPA's IRIS (1989b) program classified cadmium as a "probable human carcinogen" through *inhalation* but noted that *oral* exposure studies in laboratory rodents provide no evidence of carcinogenicity. The existing criterion for cadmium is based on an RfD from the

1989 IRIS assessment of 0.0005 mg/kg/day. The RfD was based on kidney damage in humans from a review of animal and human studies (as reported in USEPA 1986b).

ATSDR (2012) derived a chronic duration oral minimal risk level (MRL) for cadmium. By conducting a meta-analysis of environmental epidemiological studies examining indicators of renal function published after the 1989 IRIS assessment, ATSDR derived a chronic MRL of 0.00011 mg/kg/day. As MRLs and RfDs are derived through a similar process (that is, the application of appropriate uncertainty factors to a POD), chronic MRLs are considered equivalent to RfDs for the purpose of ground water quality criteria development and were used by the USEPA (2015) to develop criteria recommendations. Based on this updated toxicity factor, the Department is proposing to revise the criterion from four µg/L to 0.92 µg/L.

4-Chloroaniline (p-Chloroaniline) (106-47-8)

The existing criterion for 4-chloroaniline is based on an RfD of 0.004 mg/kg/day from a 1988 IRIS assessment where carcinogenicity was not assessed (USEPA 1988a).

The updated criterion is based on a more recent PPRTV (USEPA 2008d). Based on adrenal tumors in rats, the USEPA (2008d) derived a cancer slope factor of 0.19 $(mg/kg/day)^{-1}$. Based on this updated cancer slope factor, the Department is proposing to revise the criterion from 30 µg/L to 0.18 µg/L.

4-Chloro-3-methylphenol (3-methyl-4-chlorophenol) (59-50-7)

An interim generic ground water quality criterion of 100 µg/L currently exists. The USEPA's IRIS program has not assessed 4-chloro-3-methylphenol. Pursuant to the USEPA's 1986

Guidelines for Carcinogen Risk Assessment (USEPA 1986a), 3-methyl-4-chlorophenol is classified as Group D, "not classifiable as to human carcinogenicity" (USEPA 2015).

In 2015, the USEPA Office of Water updated its human health ambient water quality criteria for 3-methyl-4-chlorophenol (USEPA 2015) based on a 1997 USEPA Office of Pesticide Programs Reregistration Eligibility Decision (USEPA 1997b). Based on decreased brain weight in female rats from a 1993 chronic dietary study, the USEPA derived an RfD of 0.10 mg/kg/day.

The 1993 chronic rat study was also considered in a 2009 PPRTV assessment (USEPA 2009a). However, the USEPA did not derive an RfD based on this study because it was unpublished. The USEPA derived a "chronic screening value" of 0.1 mg/kg/day based on skewed offspring sex ratios in an unpublished 1992 developmental rat study (USEPA 2009a).

Although based on different endpoints from different study designs, the RfD of 0.1 mg/kg/day used by the USEPA Office of Water in 2015 is identical to the screening value derived in the 2009 PPRTV assessment. Based on the updated RfD, the Department is proposing a specific criterion of 700 µg/L.

Chlorpyrifos (2921-88-2)

The existing criterion for chlorpyrifos is based on the RfD from a 1987 IRIS assessment that was removed from the IRIS database in 2011.

The updated criterion is based on a risk assessment by ATSDR (1997). Based on acetylcholinesterase inhibition, ATSDR derived a chronic MRL of 0.001 mg/kg/day. As MRLs and RfDs are derived through a similar process (that is, the application of appropriate uncertainty factors to a POD), chronic MRLs are considered equivalent to RfDs for the purpose of ground

water quality criteria calculations and were used by the USEPA (2015) to develop criteria recommendations. Based on this toxicity factor, the Department is proposing to revise the criterion from 20 µg/L to seven µg/L.

Cobalt (7440-48-4)

The existing criterion for cobalt is based on an RfD of 0.02 mg/kg/day from a 2002 USEPA assessment (NJDEP 2017). The USEPA's IRIS program has not assessed cobalt.

The updated criterion for cobalt is based on a PPRTV (USEPA 2008c). Cobalt is known to decrease iodine uptake by the thyroid in humans, potentially resulting in decreased production of thyroid hormones. Based on decreased iodine uptake in humans, the USEPA derived an RfD of 0.0003 mg/kg/day. Based on this updated RfD, the Department is proposing to revise the criterion from 100 µg/L to two µg/L.

4,4'-DDE (Dichlorodiphenyldichloroethylene) (72-55-9)

Utilizing the USEPA's 1986 Guidelines for Carcinogen Risk Assessment (USEPA 1986a), the USEPA classified 4,4'-DDE as Group B2, "probable human carcinogen" in 1988 (USEPA 1988b). The existing criterion for 4,4'-DDE is based on increased incidence of liver tumors in mice and hamsters, which was used by the USEPA's IRIS program to derive a cancer slope factor of 0.34 $(mg/kg/day)^{-1}$ (USEPA 1988b).

Using the most sensitive of these data (female B6C3F1 mice) and more current carcinogen risk assessment approaches, the USEPA's Office of Water (2008a) developed a cancer slope factor of

0.167 $(mg/kg/day)^{-1}$. Based on this updated cancer slope factor, the Department is proposing to revise the criterion from 0.1 µg/L to 0.20 µg/L.

Dibromochloromethane (Chlorodibromomethane) (124-48-1)

Utilizing the USEPA's 1986 Guidelines for Carcinogen Risk Assessment (USEPA 1986a), the USEPA classified dibromochloromethane as Group C, "possible human carcinogen" in 1990 (USEPA 1990b). The basis for the existing criterion is increased incidence of liver tumors in female mice, which was used by the USEPA's IRIS program to derive a cancer slope factor of 0.084 $(mg/kg/day)^{-1}$ (USEPA 1990b).

Using the same tumor data as IRIS and more current carcinogen risk assessment approaches, the USEPA (2005a) developed a cancer slope factor of 0.043 $(mg/kg/day)^{-1}$. Based on this updated cancer slope factor, the Department is proposing to revise the criterion from 0.4 µg/L to 0.78 µg/L.

1,2-Dibromo-3-chloropropane (DBCP) (96-12-8)

Utilizing the USEPA's 2005 Guidelines for Carcinogen Risk Assessment (USEPA 2005b), the USEPA classified DBCP as "likely to be carcinogenic to humans" in 2006 (USEPA 2006). The USEPA's IRIS program has not derived an RfD or cancer slope factor for DBCP. The basis for the existing criterion is a cancer slope factor of 1.4 $(mg/kg/day)^{-1}$, which is based on stomach, kidney, and liver tumors in rats from a 1977 dietary study from the USEPA's Health Effects Assessment Summary Tables (USEPA 1997a).

Using data from the same 1977 study and applying benchmark dose modeling, a USEPA (2006) PPRTV assessment derived a cancer slope factor of 0.81 $(mg/kg/day)^{-1}$ based on kidney tumors in male rats. Based on a weight of evidence evaluation, the USEPA concluded that DBCP

is carcinogenic by a mutagenic mode of action (USEPA 2006). As recommended for contaminants with a mutagenic mode of action for carcinogenicity in the USEPA (2005b) risk assessment guidance, age-dependent adjustment factors were applied to the cancer slope factor in the 2006 PPRTV assessment (USEPA 2006). Based on this updated cancer slope factor of 0.81 $(mg/kg/day)^{-1}$, and the application of age-dependent adjustment factors, the Department is proposing to revise the criterion from 0.02 µg/L to 0.016 µg/L.

1,2-Dichlorobenzene (ortho) (95-50-1)

Utilizing the USEPA's 1986 Guidelines for Carcinogen Risk Assessment (USEPA 1986a), the USEPA classified 1,2-dichlorobenzene (ortho) as Group D, "not classifiable as to human carcinogenicity" in 1989 (USEPA 1989c). The existing criterion for 1,2-dichlorobenzene (ortho) is based on an RfD from a health-based MCL developed by the NJDWQI (1987b). This RfD of 0.086 mg/kg/day is based on kidney lesions in male rats in a 1985 chronic gavage study. Similarly, an RfD of 0.09 mg/kg/day based on the same 1985 principal study was derived by a 1989 IRIS assessment (USEPA 1989c).

In 2006, ATSDR derived a chronic MRL of 0.3 mg/kg/day based on the development of kidney lesions in rats from the same 1985 principal study as the 1987 NJDWQI and 1989 IRIS RfDs but using benchmark dose modeling.

In deriving its MRL, ATSDR did not apply an uncertainty factor for database deficiencies, although this uncertainty factor is included in the NJDWQI (1987b) and the USEPA (1989c) RfDs. Recognizing a lack of reproductive and developmental data for 1,2-dichlorobenzene (that is, database deficiencies), the Department applied an uncertainty factor of 10 to account for this

deficiency, along with uncertainty factors for inter- and intra-species extrapolation (a factor of 10 for each). Applying a total uncertainty factor of 1000 to the ATSDR POD (30.74 mg/kg/day) yields a chronic MRL of 0.031 mg/kg/day. As MRLs and RfDs are derived through a similar process (that is, the application of appropriate uncertainty factors to a POD), chronic MRLs are considered equivalent to RfDs for the purpose of ground water quality criteria calculations and were used by the USEPA (2015) to develop criteria recommendations. Based on this updated toxicity factor, the Department is proposing to revise the criterion from 600 µg/L to 210 µg/L.

The uncertainty factors applied in the derivation of the RfD are:

10 (interspecies), to account for animal-to-human extrapolation.

10 (intraspecies variability), to protect sensitive human subpopulations.

1 (duration of exposure), no adjustment needed as the principal study involved chronic exposure.

1 (use of a LOAEL, NOAEL or BMDL as the POD), no adjustment needed as a BMDL was used.

10 (database deficiencies), to account for a lack of reproductive and developmental data.

UF Total = 1000

RfD = POD/UF Total = (30.74 mg/kg/day) / 1000 = 0.0374 (rounds to 0.031 mg/kg/day)

<u>1,3-Dichlorobenzene (meta) (541-73-1)</u>

Utilizing the USEPA's 1986 Guidelines for Carcinogen Risk Assessment (USEPA 1986a), the USEPA classified 1,3-dichlorobenzene (meta) as Group D, "not classifiable as to human carcinogenicity" in 1990 (USEPA 1990c). The USEPA's IRIS program has not assessed 1,3-dichlorobenzene. The existing criterion for 1,3-dichlorobenzene (meta) is based on an RfD of 0.086 mg/kg/day from a health-based MCL developed by the NJDWQI (1987b). This RfD is based on the use of a chronic gavage study in mice of the surrogate chemical 1,2-dichlorobenzene where kidney damage was observed.

ATSDR (2006) derived an intermediate duration MRL of 0.02 mg/kg/day from a POD of 2.1 mg/kg/day using benchmark dose modeling, based on the histological changes in the pituitary gland in male rats from a 1995 subchronic gavage study of 1,3-dichlorobenzene.

In 2009, the NJDWQI reevaluated 1,3-dichlorobenzene and developed an RfD of 0.0009 mg/kg/day based on the LOAEL for cholesterol and lactate dehydrogenase changes (male), as well as histological changes in the thyroid gland (male and female) and the pituitary gland (male) of rats from the same 1995 subchronic gavage study (NJDWQI 2009).

Based on USEPA (2012a) guidance, it is preferable to derive an RfD based on benchmark dose modeling rather than on a LOAEL, as benchmark dose modeling considers all of the dose-response data for the critical effect from the principal study. Therefore, the 2006 ATSDR intermediate MRL was selected as the starting point for development of the recommended RfD. As the ATSDR MRL did not account for the lack of reproductive data with an uncertainty factor for database deficiencies, and it was intended to protect for less-than-chronic (intermediate) duration of exposure, the Department deems it appropriate to apply additional uncertainty factors

of three for database deficiencies and 10 for less-than-chronic duration of the principal study. Combined with the uncertainty factors used by ATSDR (UF_{human} = 10, UF_{animal} = 10), a total uncertainty factor of 3000 is applied to the POD, resulting in an RfD of 0.00070 mg/kg/ day, which is slightly more stringent than the 2009 NJDWQI RfD of 0.0009 mg/kg/day. Based on this updated RfD, the Department is proposing to revise the criterion from 600 µg/L to 4.7 µg/L.

The uncertainty factors applied in the derivation of the RfD are:

10 (interspecies), to account for animal-to-human extrapolation.

10 (intraspecies variability), to protect sensitive human subpopulations.

10 (duration of exposure), the principal study involved subchronic exposure.

1 (use of a LOAEL, NOAEL or BMDL as the POD), no adjustment needed as a BMDL was used.

3 (database deficiencies), to account for a lack of reproductive data for 1,3-dichlorobenzene.

UF Total = 3000

RfD = POD/UF Total = (2.1 mg/kg/day) / 3000 = 0.00070 mg/kg/day

1,4-Dichlorobenzene (para) (106-46-7)

The NJDWQI classified 1,4-dichlorobenzene (para) as Group C, “possible human carcinogen” (NJDWQI 1994). The USEPA’s IRIS program has not derived an RfD or cancer slope factor for 1,4-dichlorobenzene. The existing criterion for 1,4-dichlorobenzene (para) is based on an MCL promulgated by the USEPA. This MCL is based on an RfD of 0.0107 mg/kg/day, which is based on a NOAEL from a 1987 subchronic mouse study (reviewed in NJDWQI 2009).

In 2009, the NJDWQI reevaluated 1,4-dichlorobenzene (para) and developed an RfD of 0.0023 mg/kg/day based on liver, kidney, and blood effects in dogs from a 1996 chronic capsule study (NJDWQI 2009). As with the 1994 NJDWQI RfD, an uncertainty factor of 10 for potential carcinogenicity was used in deriving the RfD. Based on the updated RfD of 0.0023 mg/kg/day, the Department is proposing to revise the criterion from 75 µg/L to 15 µg/L.

1,1-Dichloroethane (1,1-DCA) (75-34-3)

The NJDWQI classified 1,1-dichloroethane as New Jersey Category II (equivalent to the USEPA "suggestive evidence of human carcinogenic potential") (NJDWQI 2009). The USEPA's IRIS program has not published an RfD or cancer slope factor for 1,1-dichloroethane. The existing criterion for 1,1-dichloroethane is based on an RfD of 0.0065 mg/kg/day from a health-based MCL developed by the NJDWQI (1994). This RfD is based on kidney damage in cats from a 1971 subchronic inhalation study with a NOAEL of 500 ppm (2025 mg/m^3) that is equivalent to an oral dose of 32.5 mg/kg/day.

In 2009, the NJDWQI reevaluated 1,1-dichloroethane and developed an RfD of 0.00325 mg/kg/day based on the same endpoint in the same 1971 cat study used in NJDWQI (1994). In deriving the updated RfD, the NJDWQI removed an uncertainty factor of five (for small sample size) used in the 1994 RfD and incorporated an uncertainty factor of 10 (for suggestive carcinogenicity). Based on the updated RfD of 0.00325 mg/kg/day, the Department is proposing to revise the criterion from 50 µg/L to 22 µg/L.

The uncertainty factors applied in the derivation of the RfD are:

10 (interspecies), to account for animal-to-human extrapolation.

10 (intraspecies variability), to protect sensitive human subpopulations.

10 (duration of exposure), the principal study involved subchronic exposure.

1 (use of a LOAEL, NOAEL or BMDL as the POD), no adjustment needed as a NOAEL used.

1 (database deficiencies), no adjustment judged necessary.

10 (NJDEP Group C/suggestive carcinogen policy), 1,1-dichloroethane identified as a suggestive human carcinogen, and there is no available cancer slope factor.

UF Total = 10,000

RfD = POD/UF Total = (32.5 mg/kg/day) / 10,000 = 0.00325 mg/kg/day

1,1-Dichloroethylene (1,1-DCE):

The current ground water quality criterion for 1,1-dichloroethylene is based on an RfD from a health-based MCL developed by the NJDWQI (1987c). This RfD of 0.00014 mg/kg/day is based on liver necrosis in mice chronically exposed via gavage in a 1982 study. The NJDWQI classified 1,1-dichloroethylene as a Group C carcinogen. Consistent with the NJDWQI policy for contaminants with evidence of human carcinogenic potential, an additional uncertainty factor of 10 was used in deriving the RfD.

In 2009, the NJDWQI reevaluated 1,1-dichloroethylene and developed an RfD of 0.009 mg/kg/day based on the NOAEL for fatty changes in the liver of rats from a 1983 chronic drinking water study (NJDWQI 2009). Drinking water studies are preferred to gavage studies for risk

assessment of contaminants such as 1,1-dichloroethylene. As with the 1987 NJDWQI RfD, an uncertainty factor of 10 to account for potential carcinogenicity was used in deriving the RfD.

In 2002, IRIS derived an RfD of 0.0046 mg/kg/day, based on the same principal study and endpoint as the 2009 NJDWQI RfD, but using benchmark dose modeling (USEPA 2002a). Pursuant to the USEPA's 1986 Guidelines for Carcinogen Risk Assessment (USEPA 1986a) and 1999 Review Draft Guidelines for Carcinogen Risk Assessment (USEPA 1999b), 1,1-dichloroethylene is classified as Group C, "possible human carcinogen" and exhibits "suggestive evidence" of carcinogenicity, but not sufficient evidence to assess human carcinogenic potential, respectively (USEPA 2002a). Specifically, USEPA (2002a) concluded that 1,1-dichloroethylene exhibits suggestive evidence of carcinogenicity following inhalation exposure in studies in rodents, but that the data for 1,1-dichloroethylene are inadequate for an assessment of human carcinogenic potential by the oral route. As it is preferable to base an RfD on benchmark dose modeling rather than on a NOAEL under current risk assessment approaches, the RfD of 0.0046 mg/kg/day developed by USEPA (2002a) is recommended as the starting point for the RfD. However, the Department concludes that there is suggestive evidence for carcinogenicity of 1,1-dichloroethylene by the oral route for reasons presented in NJDWQI (2009). Therefore, an additional uncertainty factor of 10 is applied to account for potential carcinogenicity when deriving the criterion based on the IRIS RfD of 0.0046 mg/kg/day. Based on this updated RfD, the Department is proposing to revise the criterion from one µg/L to 31 µg/L.

1,2-Dichloropropane (78-87-5)

The USEPA's Health Effects Assessment Summary Tables (HEAST) classified 1,2-dichloropropane as Group B2, "probable human carcinogen" (USEPA 1997a). The USEPA's IRIS program has not derived an RfD or cancer slope factor for 1,2-dichloropropane. The existing criterion is based on increased incidence of liver tumors in male mice, which was used by the USEPA to derive a HEAST cancer slope factor of 0.068 $(mg/kg/day)^{-1}$ (USEPA 1997a).

Using the same tumor data and more current carcinogen risk assessment approaches, California EPA (CalEPA 1999a) developed a cancer slope factor of 0.036 $(mg/kg/day)^{-1}$. Based on this updated cancer slope factor, the Department is proposing to revise the criterion from 0.5 µg/L to 0.92 µg/L.

Dimethyl phthalate (131-11-3)

An interim generic ground water quality criterion of 100 µg/L currently exists. Pursuant to the USEPA's 1986 Guidelines for Carcinogen Risk Assessment (USEPA 1986a), dimethyl phthalate is classified as Group D, "not classifiable as to human carcinogenicity" (USEPA 2015). The USEPA's IRIS program has not derived an RfD or cancer slope factor for dimethyl phthalate.

In 2015, the USEPA Office of Water updated its human health ambient water quality criteria for dimethyl phthalate (USEPA 2015) based on a 1980 Office of Water assessment of phthalates (USEPA 1980). Based on a growth effect in rats orally exposed for two years in a 1948 study (Draize et al. 1948), the 1980 USEPA assessment derived an RfD of 10 mg/kg/day based on a NOAEL of 1000 mg/kg/day. This 1948 study does not provide data on numerous other toxicological endpoints that are routinely reported in more recent chronic animal studies.

As stated above, the 1948 rat study (Draize et al. 1948) did not include a comprehensive evaluation of toxicity endpoints (for example, standard biochemical and hematological endpoints). A 2007 PPRTV assessment (USEPA 2007b) concluded that neither Draize et al. (1948) or a subsequent review of this study by Lehman (1955) provided sufficient detail in methodology and data reporting (for example, direction and severity of effects) to identify an NOAEL/LOAEL. Therefore, the 2007 USEPA assessment did not derive an RfD based on the 1948 study, while also noting a general lack of chronic oral studies of dimethyl phthalate in laboratory animals. Instead, the USEPA derived an oral subchronic reference screening value of 0.1 mg/kg/day based on decreased serum testosterone levels from a 1980 study in which five-week-old male rats were exposed for one week at a single dose level. The USEPA also noted the general lack of adverse reproductive and developmental effects in offspring following maternal dimethyl phthalate exposure.

Considering the lack of information on chronic toxicological effects that are not reported by Draize et al. (1948), the Department applied an uncertainty factor of three to the USEPA RfD of 10 mg/kg/day to account for database deficiencies. As a result, an RfD of three mg/kg/day was used to derive the proposed criterion of 20,000 µg/L.

The uncertainty factors applied in the derivation of the RfD are:

10 (interspecies), to account for animal-to-human extrapolation.

10 (intraspecies variability), to protect sensitive human subpopulations.

1 (duration of exposure), the principal study involved chronic exposure.

1 (use of a LOAEL, NOAEL or BMDL as the POD), no adjustment needed as a NOAEL was used.

3 (database deficiencies), to account for a general lack of toxicological information, particularly following chronic exposure.

UF Total = 300

RfD = POD/UF Total = (1000 mg/kg/day) / 300 = 3.3 (rounded to 3) mg/kg/day

Di-n-octyl phthalate (117-84-0)

The USEPA's IRIS program has not assessed di-n-octyl phthalate. The existing criterion for di-n-octyl phthalate is based on an RfD from the USEPA's HEAST (1997a).

The USEPA developed a PPRTV for di-n-octyl phthalate (USEPA 2012b) that includes an updated RfD of 0.012 mg/kg/day based on observations of cytoplasmic vacuolation in the livers of male rats. Based on this updated RfD, the Department is proposing to revise the criterion from 100 µg/L to 80 µg/L.

Ethion (563-12-2)

The existing criterion for ethion is based on an RfD of 0.0005 mg/kg/day from the USEPA's IRIS program (USEPA 1989d).

In 2000, ATSDR derived an MRL of 0.0004 mg/kg/day based on brain acetylcholinesterase inhibition in male dogs (ATSDR 2000). As MRLs and RfDs are derived through a similar process (that is, the application of appropriate uncertainty factors to a POD), chronic MRLs are considered equivalent to RfDs for the purpose of ground water quality criteria calculations and were used by

the USEPA (2015) to develop criteria recommendations. Based on this updated toxicity factor, the Department is proposing to revise the criterion from four µg/L to three µg/L.

Ethylbenzene (100-41-4)

Utilizing the USEPA's 1986 Guidelines for Carcinogen Risk Assessment (USEPA 1986a), the USEPA classified ethylbenzene as Group D, "not classifiable as to human carcinogenicity" in 2015 (USEPA 2015). The existing criterion for ethylbenzene is based on an RfD of 0.1 mg/kg/day, which is based on liver and kidney toxicity in female rats exposed through gavage for 182 days in a 1956 study, derived in a 1985 IRIS assessment (USEPA 1985).

In 2015, the USEPA's Office of Water updated the human health ambient water quality criteria for ethylbenzene (USEPA 2015) based on a 2015 Health Canada assessment (HC 2015). Health Canada derived a tolerable daily intake of 0.022 mg/kg/day based on pituitary gland and liver cell toxicity in mice chronically exposed via inhalation in a 1999 National Toxicology Program study and a physiologically based pharmacokinetic (PBPK) model for route-to-route extrapolation. Based on this updated RfD of 0.022 mg/kg/day, the Department is proposing to revise the criterion from 700 µg/L to 150 µg/L.

Ethylene glycol (107-21-1)

The existing criterion for ethylene glycol is based on an RfD from a 1987 assessment by the NJDWQI (1987d). A 1989 IRIS assessment derived an RfD of two mg/kg/day based on a NOAEL for renal effects in a chronic rat dietary study (USEPA 1989e).

In 2010, ATSDR derived a chronic MRL of 0.76 mg/kg/day based on the occurrence of an extra lumbar rib in mouse fetuses in the absence of observed maternal toxicity and using

benchmark dose modeling (ATSDR 2010). As MRLs and RfDs are derived through a similar process (that is, the application of appropriate uncertainty factors to a POD), chronic MRLs are considered equivalent to RfDs for the purpose of ground water quality criteria calculations and were used by the USEPA (2015) to develop criteria recommendations. Based on this updated toxicity factor, the Department is proposing to revise the criterion from 300 µg/L to 5,100 µg/L.

Heptachlor (76-44-8)

Utilizing the USEPA's 1986 Guidelines for Carcinogen Risk Assessment (USEPA 1986a), the USEPA classified heptachlor as Group B2, "probable human carcinogen" in 1987 (USEPA 1987a). The existing criterion for heptachlor is based on a cancer slope factor of 4.5 $(mg/kg/day)^{-1}$, which is based on liver tumors in mice, derived in a 1987 IRIS assessment (USEPA 1987a). Based on the same mouse data as in the 1987 IRIS assessment, and using more current risk assessment approaches, CalEPA (1999b) derived a cancer slope factor of 4.1 $(mg/kg/day)^{-1}$. Based on this updated cancer slope factor, the Department is proposing to revise the criterion from 0.008 µg/L to 0.0081 µg/L.

Heptachlor Epoxide (1024-57-3)

Utilizing the USEPA's 1986 Guidelines for Carcinogen Risk Assessment (USEPA 1986a), the USEPA classified heptachlor epoxide as Group B2, "probable human carcinogen" in 1987 (USEPA 1987b). The existing criterion for heptachlor epoxide is based on a cancer slope factor of 9.1 $(mg/kg/day)^{-1}$, which is based on liver tumors in mice, derived in a 1987 IRIS assessment (USEPA 1987b).

Based on the same mouse data as in the 1987 IRIS assessment, and using more current risk assessment approaches, CalEPA (1999b) derived a cancer slope factor of 5.5 $(mg/kg/day)^{-1}$. Based on this updated cancer slope factor, the Department is proposing to revise the criterion from 0.004 µg/L to 0.0061 µg/L.

Hexachlorobenzene (118-74-1)

Utilizing the USEPA's 1996 Proposed Guidelines for Carcinogen Risk Assessment (USEPA 1996), the USEPA classified hexachlorobenzene as Group B2, "probable human carcinogen" in 2015 (USEPA 2015). The existing criterion for hexachlorobenzene is based on a cancer slope factor of 1.6 $(mg/kg/day)^{-1}$, which is based on liver tumors in rats derived in a 1989 IRIS assessment (USEPA 1989f). The 2015 USEPA Office of Water human health ambient water quality criteria for hexachlorobenzene (USEPA 2015) are based on a USEPA Office of Pesticide Programs Reregistration Eligibility Decision (USEPA 2008b). Based on the same rat data as in the 1989 IRIS assessment, and using more current risk assessment approaches, the Office of Pesticide Programs derived a cancer slope factor of 1.02 $(mg/kg/day)^{-1}$. Based on this updated cancer slope factor, the Department is proposing to revise the criterion from 0.02 µg/L to 0.033 µg/L.

Hexachlorobutadiene (87-68-3)

Utilizing the USEPA's 1996 Proposed Guidelines for Carcinogen Risk Assessment (USEPA 1996), the USEPA classified hexachlorobutadiene as Group C, "possible human carcinogen" in 1987 (USEPA 1987c). The basis for the existing criterion is increased incidence of kidney tumors in male rats, which was used by the USEPA's IRIS program to derive a cancer slope factor of 0.078 $(mg/kg/day)^{-1}$ (USEPA 1987c).

Using the same study as in the 1987 IRIS assessment, but using female rat kidney tumor data and more current carcinogen risk assessment approaches, the USEPA developed a cancer slope factor of 0.04 $(mg/kg/day)^{-1}$ (USEPA 2003). Based on this updated cancer slope factor, the Department is proposing to revise the criterion from 0.4 µg/L to 0.8 µg/L.

Methoxychlor (72-43-5)

Utilizing the USEPA's 1986 Guidelines for Carcinogen Risk Assessment (USEPA 1986a), the USEPA classified methoxychlor as Group D, "not classifiable as to human carcinogenicity" in 1990 (USEPA 1990d). The existing criterion for methoxychlor is based on an RfD of 0.005 mg/kg/day, which is based on loss of litters in rabbits from a 1986 teratology study, derived in a 1990 IRIS assessment (USEPA 1990d).

CalEPA (2010) derived an RfD of 0.00002 mg/kg/day based on increased prostate and seminal vesicle weights in the offspring of mice orally exposed in a 1999 study. Based on this updated RfD, the Department is proposing to revise the criterion from 40 µg/L to 0.1 µg/L.

1,2,4-Trichlorobenzene (120-82-1)

Utilizing the USEPA's 2005 Guidelines for Carcinogen Risk Assessment (USEPA 2005b), the USEPA classified 1,2,4-trichlorobenzene as "likely to be carcinogenic to humans" by the oral route of exposure based on a finding of increased tumor incidence in more than one sex of mouse in 2009 (USEPA 2009b). The USEPA's IRIS program has not derived a cancer slope factor for 1,2,4-trichlorobenzene. The existing criterion for 1,2,4-trichlorobenzene is based on an RfD of 0.0012 mg/kg/day from a health-based MCL developed by the NJDWQI (1987e). This RfD is based on increased urinary excretion of porphyrins in rats from a 1978 subchronic inhalation study.

In 2009, the NJDWQI reevaluated 1,2,4-trichlorobenzene and developed an RfD of 0.0026 mg/kg/day based on distended abdomens and increased liver weight in mice from a 1994 chronic oral study (NJDWQI 2009). With this reevaluation, the NJDWQI classified 1,2,4-trichlorobenzene as a suggestive carcinogen. Consistent with the NJDWQI policy for contaminants with evidence of human carcinogenic potential that do not have a cancer slope factor, an additional uncertainty factor of 10 was used in deriving the RfD. As discussed in the NJDWQI (2009) assessment, the USEPA's IRIS program derived an RfD of 0.01 mg/kg/day based on adrenal effects from a subchronic rat study (USEPA 1992b). NJDWQI (2009) ultimately concluded that the IRIS RfD was not the most appropriate basis, as no chronic studies were available when the 1992 IRIS RfD was developed.

Also in 2009, a PPRTV assessment (USEPA 2009b) derived a cancer slope factor of 0.029 $(mg/kg/day)^{-1}$ based on liver tumors in male mice orally exposed. Based on this updated cancer slope factor of 0.029 $(mg/kg/day)^{-1}$, the Department is proposing to revise the criterion from nine µg/L to 1.1 µg/L.

1,1,1-Trichloroethane (TCA) (71-55-6)

Utilizing the USEPA's 2005 Guidelines for Carcinogen Risk Assessment (USEPA 2005b), the USEPA determined in 2007 that there is "inadequate information to assess the carcinogenic potential" of 1,1,1-trichloroethane (USEPA 2007a). The existing criterion is based on an RfD of 0.0037 mg/kg/day from a health-based MCL developed by the NJDWQI (1987f). This RfD is based on liver toxicity in mice exposed through inhalation for 14 weeks.

In a 2007 IRIS assessment (USEPA 2007a), the USEPA derived an RfD of two mg/kg/day based on decreased body weight gain in female mice. In 2009, the NJDWQI reevaluated 1,1,1-trichloroethane and developed an RfD of 0.28 mg/kg/day based on decreased body weight gain in male mice exposed through microcapsules in feed for 13 weeks from the same principal study as the 2007 IRIS assessment (NJDWQI 2009). Although based on the same endpoint (body weight gain) and principal study, the 2007 IRIS assessment based its RfD on female mice which were less sensitive than males to the body weight effects of 1,1,1-trichloroethane. The 2009 NJDWQI RfD, based on a study with oral exposure, is also preferable to the 1987 NJDWQI RfD, which was based on an inhalation study. Based on the updated RfD of 0.28 mg/kg/day, the Department is proposing to revise the criterion from 30 µg/L to 1,900 µg/L.

Remediation Standards at N.J.A.C. 7:26D-7.2(b)

The GWQS are implemented by the Site Remediation and Waste Management Program as the remediation standards for the cleanup of ground water contamination sites pursuant to the Remediation Standards, N.J.A.C. 7:26D. N.J.A.C. 7:26D-7.2(b) provides that "the Department shall update a soil and a soil leachate remediation standard for the migration to ground water exposure pathway at N.J.A.C. 7:26D Appendix 1 when a ground water quality criterion is updated pursuant to the Ground Water Quality Standards at N.J.A.C. 7:9C-1.7(c)5" (that is, when the Department publishes a notice of administrative change to modify or add a specific criterion to Appendix Table 1 of the GWQS). The remediation standard is updated by notice of administrative change pursuant to N.J.A.C. 7:26D-7.2(c) and (d).

The Department proposes to amend the Remediation Standards at N.J.A.C. 7:26D-7.2(b) to reference N.J.A.C. 7:9C-1.7(c), instead of (c)5. This will allow the Department to update the "companion" remediation standard when it modifies or adds a ground water quality criterion to Appendix Table 1 through either a rulemaking or notice of administrative change. These updates to the Remediation Standards will be published concurrent with the adoption of a GWQS proposal.

Social Impact

The Department anticipates that the proposed amendments to the GWQS will have an overall positive social impact through the protection of public health. According to a 2018 United States Geological Survey study, approximately 7.99 million New Jersey residents, or 89 percent of the State population, were served by a public water supply in 2015. Of all New Jersey public water supply withdrawals in 2015, approximately 48 percent, or 379 million gallons per day, were supplied from ground water. The remaining 11 percent of the State population not served by public water systems, an estimated 966,000, relies on ground water accessed through private wells for domestic water supply (Dieter et al., 2018).

The GWQS are implemented as ground water discharge limitations at either the point of discharge or at the property boundary through NJPDES Discharge to Ground Water (DGW) permits pursuant to N.J.A.C. 7:14A, and as remediation standards for the cleanup of ground water contamination sites pursuant to N.J.A.C. 7:26D and 26E. The proposed updates to specific ground water quality criteria, PQLs, and ground water quality standards ensure that programs

implementing the GWQS, as well as the regulated community, use standards that are informed by the best available science. The proposed amendments to N.J.A.C. 7:9C-1.7(c)3 will enable the Department to more regularly update specific ground water quality criteria and ground water quality standards to reflect the best available toxicological information and new risk assessment methods. This will ensure that remediations of contaminated sites and affected NJPDES-DGW permits are implemented using the best available scientific information for the protection of potable ground waters, State residents who currently depend on them, and all potential future ground water users. This protection will benefit the health, property values, and peace of mind of current and future potable ground water users. Additionally, the proposed amendments revising the default values for body weight and drinking water consumption will enable the Department to derive standards that reflect current and realistic estimations of human exposure to regulated constituents, thereby protecting public health.

Economic Impact

The Department anticipates that the proposed amendments to the GWQS will have an overall positive economic impact. As explained in the Summary, the proposed ground water quality standard for 50 constituents will be lower, and thus more stringent, than the corresponding ground water quality standards now in effect. Public health will be better protected because the proposed amendments represent the best available scientific information, as of 2017, regarding health effects from exposure to these constituents. Public health is protected irrespective of 13 ground water quality standards becoming less stringent, as that too is based on the best available

scientific information. Accordingly, the overall impact of the updated criteria will be a reduction in costs related to potential health impacts due to exposure to these constituents.

The ground water quality standards proposed to be updated include those for possible, probable, and known human carcinogens; hazardous substances; and constituents with a wide array of possible or confirmed deleterious effects on the blood, nervous system, reproductive system, immune system, vital organs, and development of offspring. The prevention of these negative health outcomes through implementation of the updated ground water quality standards may reduce future medical costs borne by individuals and healthcare systems as a result of exposure to these constituents. Additionally, the values of properties and businesses that sit above, are adjacent to, or make use of current or future Class II-A ground waters may be protected or even enhanced by improving the quality of these waters.

By ensuring that constituents included at Appendix Table 1 are not discharged at levels that pose a threat to human health, this rulemaking preempts potential future costs of contamination of Class II-A ground waters. The costs of ground water contamination include environmental investigation costs, the direct cost of cleanup and remediation, costs of obtaining an alternative water supply (if a potable water supply is rendered unusable), decreased value of affected properties, and decreased public confidence in water supply safety that may promote the purchase of bottled water.

The proposed standards, where more stringent, may result in additional costs related to environmental cleanups, treatment of water to be discharged under a NJPDES-DGW permit, or analytical services required to demonstrate compliance with ground water quality standards. The

actual economic impact on persons responsible for remediating contaminated sites and on facilities discharging to ground water pursuant to an NJPDES permit will depend on site-specific factors, such as the increase in the portion of the plume that must be remediated, the volume and characteristics of the wastewater being discharged, the contaminants in the wastewater or ground water, the number of additional monitoring wells required, and the type of treatment currently being implemented.

Potential additional costs incurred by persons responsible for remediating contaminated sites or by facilities complying with NJPDES-DGW permits are likely to be offset by potential cost savings for future users of ground water that might otherwise require additional treatment. Pollution allowed in State waters today may result in future costs. Restoring waters once they become impaired is a difficult, time consuming, and expensive process. Therefore, it is generally more cost-effective to prevent degradation through protecting water quality and maintaining designated uses than to restore the waters after they become degraded.

Site Remediation

The Department anticipates that the proposed amendments will have an economic impact on persons responsible for conducting remediation of contaminated sites. The magnitude of the impact will vary based on the site and the contaminants to be remediated. As explained above, the proposed ground water quality standard for 50 constituents will be more stringent than the current ground water quality standard. In some cases, the more stringent standards will result in additional remediation costs, although the Department is not able to estimate the magnitude of the increase in costs due to the unique conditions of each site. The proposed ground water quality standards for

13 constituents that are becoming less stringent are not expected to result in additional remediation costs and could possibly reduce the cost of remediation in some cases, as explained below.

As of October 2023, there were 13,331 active site remediation cases in New Jersey. Ground water contamination has been found in approximately 43 percent of those cases. Of the 5,722 active ground water remediation cases in New Jersey, 3,399 contain constituents for which the ground water quality standard will become more stringent. The proposed 50 more stringent ground water quality standards will be applied to all new cases in which any one or more of the constituents is found and to those existing cases in which any one or more of the constituents is found and the person responsible for conducting the remediation has not obtained a Department-approved or LSRP-certified remedial action workplan (RAW) or similar plan that describes the extent of contamination at a site and the remedial action to be implemented to address that contamination by the time these proposed amendments to the GWQS are promulgated.

The ground water quality standards for seven constituents – 1,1-biphenyl; cobalt; cyanide (free); 1,3-dichlorobenzene (meta); heptachlor epoxide; methoxychlor; and vinyl chloride – are becoming more stringent by one or more orders of magnitude (see Table 2 above) and could trigger the "order of magnitude" provisions of the Brownfield and Contaminated Site Act, which may require additional remediation. As provided in the Brownfield Act at N.J.S.A. 58:10B-12j, the Department cannot compel the use of a newly promulgated remediation standard at a site that has an approved RAW unless the new remediation standard differs from the remediation standard approved in the RAW or other plan by an order of magnitude or more. Also, as provided in the Brownfield Act at N.J.S.A. 58:10B-13e, the Department cannot compel the use of a newly

promulgated remediation standard at a site that has been issued a final remediation document, such as a No Further Action (NFA) letter of Response Action Outcome (RAO), unless the new remediation standard differs from the remediation standard approved in the final remediation document by an order of magnitude, and the difference between the new remediation standard and the concentration of a contaminant at the site differs by an order of magnitude or more. In those cases, the Brownfield Act mandates that the new remediation standard must be used.

There are potentially significant economic impacts for sites that require additional remedial action under the "order of magnitude" provisions of the Brownfield Act. As of October 17, 2023, the Department is aware of 406 active sites and 153 closed sites with 1,1-biphenyl contamination in excess of the proposed GWQS; 908 active sites and 312 closed sites with cobalt contamination in excess of the proposed GWQS; 125 active sites and 35 closed sites with cyanide contamination in excess of the proposed GWQS; 324 active sites and 84 closed sites with 1,3 dichlorobenzene (meta) contamination in excess of the proposed GWQS; 64 active sites and 13 closed sites with heptachlor epoxide contamination in excess of the proposed GWQS; 23 active sites and three closed sites with methoxychlor contamination in excess of the proposed GWQS; and 1,810 active sites and 639 closed sites with vinyl chloride contamination in excess of the proposed GWQS. Closed sites with established Classification Exception Areas (CEAs) will need to be reevaluated for protectiveness at the submittal of their biennial certification. This reevaluation, at a minimum, could extend the areal extent and the duration of the CEA, or it could require further remediation to meet the new standards resulting in additional costs. Closed sites without CEAs would be reevaluated and addressed if the site requires additional remediation, which may also result in

additional costs. The costs would vary based on the site, extent of contamination and the constituent, and required remediation technology; hence it is not possible to estimate the additional costs without site-specific data. The Department anticipates that costs incurred in the additional remediation of these sites will be offset by benefits to public health, since these order of magnitude decreases are driven by the best available science regarding human health effects.

The proposed 50 more stringent standards will not result in an increase in costs in all cases. At sites with comingled contaminants, updating the ground water quality standard for a constituent that is not the driver for remediation may not result in a larger area requiring remediation if the constituent is contained within the plume. There are also no additional remediation requirements for constituents that currently have a ground water quality standard below natural background levels at a site. However, if the updated ground water quality standard is more stringent than the background water quality for that site, the persons responsible for remediation would need to ensure the background water quality is met.

Of the 5,700 active ground water remediation cases in New Jersey, 850 contain constituents for which the ground water quality standard will become less stringent. For the proposed ground water quality standards that are less stringent, it is possible that the contaminated area at a site would be smaller or no longer considered contaminated. Delineation requirements for a smaller plume would likely require fewer monitoring wells, and the remediation of the plume could take less time, thus potentially lessening the cost of the remediation. These possible impacts depend upon site-specific conditions, including the presence of other contaminants.

NJPDES Discharge to Ground Water Permits

This rulemaking includes updates to certain existing ground water quality standards, as well as the addition of two new ground water quality standards (for the two constituents that currently have interim generic criteria). The Department anticipates minimal economic impacts to NJPDES-DGW permittees as a result of the updates to the existing ground water quality standards. Regarding the two new ground water quality standards, the Department does not have data at this time, so monitoring and treatment costs cannot be anticipated.

For the updated ground water quality standards, as of 2023, there are approximately 400 active individual NJPDES-DGW permits. Approximately 70 percent of these 400 NJPDES-DGW permits regulate sanitary discharges from facilities such as schools, residential housing, restaurants, and churches. NJPDES-DGW permits for these facilities contain limitations for constituents associated with sanitary waste, and typical sanitary waste does not contain the constituents included in this rulemaking. However, sampling is required for constituents such as volatile organics that are included in this rulemaking. Volatile organics are typically not detected in sanitary waste but can be discharged, often as a result of the use of certain cleaning products. As such, permits for these facilities contain a requirement for an annual volatile organics scan to ensure these constituents are not discharged at quantities exceeding the ground water quality standards. The required response to the presence of these constituents in the waste stream is identification and removal of the source, such as discontinuing use of the offending product, since the constituents should not be associated with sanitary waste. As treatment would not be necessary and sampling is already performed for these constituents, additional cost is limited. In a case where the constituent cannot be identified or removed from the waste stream, treatment may be necessary.

Dischargers to ground water may utilize various methods of treatment, dilution, or source reduction to meet DGW effluent standards.

Approximately two percent of the roughly 400 individual NJPDES-DGW permits regulate sanitary discharges from publicly owned treatment works (POTWs). The economic impacts of the updated ground water quality standards to POTWs will be similar to the impacts to sanitary discharges identified above, as the constituents included in this rulemaking are also typically not detected in municipal waste streams. Likewise, POTWs are required to annually scan for volatile organics. Compliance with the updated ground water quality standards should not have a significant economic impact on these facilities.

The remaining 28 percent of individual NJPDES-DGW permits regulate non-sanitary discharges and consist of lined landfills and lagoons (15 percent), aquifer storage and recovery wells (three percent), and facilities that discharge process wastewater or stormwater only to ground water (10 percent). Lined landfills and lagoons do not discharge to ground water. Monitoring of these facilities is not water quality based, but rather leak detection monitoring, that would result in a repair of the liner to eliminate the discharge rather than treatment to correct an exceedance. The costs to repair a liner are not directly related to the changes in this rulemaking.

The aquifer storage and recovery wells are permitted for the injection of potable water to an aquifer for future recovery. These facilities are already required to comply with the GWQS, and many of the updated constituents are either not of concern for this activity or have not been detected in the discharge per data submitted to the Department. As such, the Department

anticipates that compliance with the updated ground water quality standards will have minimal economic impact.

For facilities that discharge process wastewater or stormwater only to ground water, sampling requirements for each facility are determined by the pollutant characterization required through the NJPDES-DGW application process. These facilities are already required to comply with the GWQS for all constituents associated with their discharge. Based upon pollutant characterizations, there are, as of 2023, 15 facilities that are required to sample pursuant to their respective NJPDES-DGW permits for the constituents included in this proposed rulemaking.

Regarding the updated ground water quality standards, the only NJPDES-DGW general permit implicated is the "I2 – Potable Water Backwash discharge" permit. There are 27 total facilities regulated under the I2 permit, and all are required to sample for the constituents included in this proposed rulemaking. However, the monitoring requirements are report only and limitations have not been imposed. If standards are exceeded, there is a requirement to identify and remedy the cause of the exceedance. Therefore, minimal economic impacts are expected for this category of dischargers.

As the majority of the NJPDES-DGW permitted facilities will not be required to alter their existing required responses to the presence of any of the updated ground water quality standards in this rulemaking, there should be minimal additional costs to comply with their existing permits. However, should any NJPDES-DGW regulated facility be required to address the presence of a constituent included in this rulemaking in their discharge, the potential cost will vary from facility to facility depending upon factors including the magnitude of the exceedance identified and the

method through which the facility chooses to comply with the standard. Dischargers to ground water may utilize various methods of treatment, dilution, or source reduction to meet DGW effluent standards.

New Jersey-Certified Environmental Laboratories

A constituent's ground water quality standard is either the constituent's specific ground water quality criterion or the PQL, whichever is higher. Of the 65 proposed updates to the ground water quality standards, 50 will become more stringent.

Regulated entities that are required to monitor ground water quality for the purposes of site remediation or demonstrating NJPDES-DGW permit compliance must obtain analytical services from a laboratory certified by the Department pursuant to the Regulations Governing the Certification of Laboratories and Environmental Measurements at N.J.A.C. 7:18 (referred to in this proposal as "environmental laboratories"). The environmental laboratory must be capable of detecting ground water constituents at the levels of the relevant ground water quality standards. Environmental laboratories are not required to offer specific analytical services for particular constituents, but rather choose which analytical services to offer based on a variety of business factors such as client demand, cost of certification, and the cost of equipment. Based upon consideration of such factors, the environmental laboratory applies to the Department for certification(s) accordingly.

Due to the methods used by the Department to develop the PQLs for each constituent, namely that a PQL must either be five times the method detection limit or based on laboratory performance data submitted to the Department upon request, the Department expects that the

majority of New Jersey-certified environmental laboratories will not have difficulty meeting most of the proposed lower PQLs. Environmental laboratories that are unable to achieve the lower PQLs with their current certifications may choose to apply to the Department for certification in additional analytical methods or to modify an existing certification to add parameters or methods. At the time of this rulemaking, modification of a laboratory certification outside of the standard renewal period entails a fee of $400.00. A category fee is also assessed for certifications in various categories of testing. For example, testing categories include “Chemical Testing (organic)” and “Chemical Testing – Inorganic, Characteristics of Hazardous Waste & Physical Analyses.” Category fees vary by category but range from $235.00 to $1,675 at the time of this rulemaking.

If a PQL was determined using a method for which an environmental laboratory does not already hold certification, and a laboratory wishes to offer analytical services sensitive enough to detect a constituent at the level of that PQL, the laboratory will have to apply to the Department for additional methods or parameter certification. This could increase the certification fee paid by the laboratory to the Department. As explained above, the exact cost of the certification fee will vary depending on whether the certification is obtained during a standard annual renewal or as a modification to an existing certification, whether the laboratory is applying for certification under a new testing category, how many testing categories are being applied for, and the specific category fee(s). Additional costs may be incurred by environmental laboratories in training employees in new analytical methods.

In some cases, environmental laboratories may choose to upgrade their analytical equipment to offer analytical services sensitive enough to detect constituents at the level of new,

lower PQLs. The price of equipment upgrades varies widely, but as capital costs, these upgrades tend to be much more costly than obtaining additional certifications. For example, many of the most common analytical methods used to detect environmental contaminants require the use of gas or liquid chromatography; searches through online laboratory equipment retailers indicate the prices of these devices range from several tens of thousands of dollars to over $100,000.

However, it should be reiterated that obtaining certification in a new analytical method or purchasing new analytical equipment is not required by the Department, but rather is the choice of individual environmental laboratories in response to various market forces and business practices. Any costs incurred by laboratories to obtain the certifications or equipment to test the level of the proposed PQLs may very well be offset by additional revenue generated from new clients attracted to the laboratory by its expanded analytical services. Increased costs incurred by laboratories that choose to pursue new method certifications or equipment upgrades as a result of this rulemaking may be passed on to the entities required to monitor ground water quality by the NJPDES Program and the Site Remediation and Waste Management Program.

Environmental Impact

The proposed amendments to the GWQS will have a positive environmental impact. As noted in the Social Impact statement, the proposed amendments to the GWQS updating specific ground water quality criteria and/or PQLs for 73 constituents of ground water will ensure that current and scientifically based standards to protect, maintain, and restore ground water quality are in place.

The environmental benefits of ground water protection often extend to surface water, as direct connections between ground water and surface water are common in many areas of the State, such as those with karst geology or high-water tables. Ground water also constitutes the base flow (that is, the lowest flow level) of many rivers, streams, and wetlands. Where interplay exists between Class II-A ground waters and surface waters, the proposed updates to specific ground water quality criteria, PQLs, and ground water quality standards will advance not only the Department's goal of restoring, enhancing, and maintaining the State's ground waters but its surface waters as well.

The proposed amendments revising the default values for body weight and drinking water consumption rate enable the Department to continue to derive standards that are most protective of human health. The proposed ground water quality standard for 50 constituents will be lower, and, thus, more stringent, than the ground water quality standard currently in effect. These more stringent standards will reduce potential adverse impacts to public health and the environment from these contaminants in ground water.

The proposed amendments to the criteria and PQLs that result in less stringent standards are not anticipated to have adverse environmental impacts. The primary designated use for Class II-A ground waters, pursuant to N.J.A.C. 7:9C-1.5(e)1, is "potable water and conversion (through conventional water supply treatment, mixing or other similar technique) to potable water." Secondary uses of Class II-A ground waters include agricultural water and industrial water. Pursuant to N.J.A.C. 7:9C-1.5(b), the Department shall "preferentially protect the primary designated use for each classification area, and shall protect any secondary designated uses to the

extent that such uses are viable using water of sufficient quality for the primary use and that the primary use is not impaired." In amending several ground water quality standards to be less stringent, the Department is implementing the best available science based upon the weight of evidence available regarding each constituent's carcinogenicity, toxicity, public welfare, or organoleptic effects. Doing so preferentially protects the primary designated use of Class II-A ground waters in accordance with N.J.A.C. 7:9C-1.5(b). The proposed amendments to the criteria and PQLs that result in less stringent standards would continue to protect public health and the environment as well as the agricultural and industrial uses.

Federal Standards Statement

N.J.S.A. 52:14B-1 et seq. (P.L. 1995, c. 65), requires that State agencies that adopt, readopt, or amend State regulations that exceed any Federal standards or requirements include in the rulemaking document a Federal standards analysis.

The proposed amendments to the GWQS that update specific ground water quality criteria and/or PQLs for 73 constituents of ground water do not exceed any Federal standards or requirements. The authority for the GWQS comes solely from New Jersey law and has no Federal counterpart. The GWQS are not promulgated pursuant to the authority of, or in order to implement, comply with, or participate in any program established pursuant to Federal law or pursuant to a State statute that incorporates or refers to Federal law, standards, or requirements.

Jobs Impact

The Department evaluated this rulemaking to determine the impact of the proposed amendments to the GWQS on job creation or retention in the State. The Department does not

anticipate that the proposed amendments will impact employment. As discussed in the Economic Impact statement, the implementation of the 50 proposed ground water quality standards that are more stringent than the existing ground water quality standards may result in additional costs for remediation; however, those costs will be site-specific, and the resultant effect, if any, on employment will depend on the business operation decisions of the persons responsible for conducting the remediation, including the technology used for the remediation, the extent of the remediation (plume), and the constituent being remediated.

As stated in the Economic Impact statement, in instances where in-State certified laboratories do not offer analytical services needed by entities regulated under the NJPDES-DGW or the Site Remediation and Waste Management Program, in-State laboratories may elect to obtain additional analytical units and certifications in order to meet client needs where there is sufficient demand, thereby creating additional skilled jobs in New Jersey. Some entities may select out-of-State certified laboratories. Jobs in the New Jersey analytical services industry may be affected if potential clients contract with out-of-State laboratories.

Agricultural Industry Impact

The GWQS are not self-implementing. They are implemented through the NJPDES rules and the Site Remediation and Waste Management Program. The NJPDES rules exempt discharges to ground water at agricultural sites, with the exception of discharges to ground water from concentrated animal feeding operations (see N.J.A.C. 7:14A-2.5(c)4). These operations are rare in New Jersey, and the Department believes that such operations will not be impacted by this rulemaking.

By protecting the primary designated use of Class II-A ground waters—potable water and conversion to potable water through conventional water supply treatment, mixing, or other similar technique—this rulemaking ensures the viability of secondary designated uses such as agricultural water, which is listed as a secondary designated use for Class II-A ground waters at N.J.A.C. 7:9C-1.5(e)1. This rulemaking therefore protects agricultural industries of the State that rely on Class II-A ground water for agricultural uses such as irrigation. The USGS estimates that in 2015, fresh ground water withdrawals in New Jersey totaled 55.1 million gallons per day (MGD) for irrigation and 0.88 MGD for livestock (Dieter et al., 2018).

Regulatory Flexibility Analysis

As required by the New Jersey Regulatory Flexibility Act, N.J.S.A. 52:14B-16 et seq., the Department has evaluated any reporting, recordkeeping, and other compliance requirements that the proposed amendments to the GWQS would impose on small businesses. The Regulatory Flexibility Act defines the term "small business" as any business that is resident in the State, is independently owned and operated, not dominant in its field, and employs fewer than 100 full-time employees.

The GWQS are implemented as ground water quality standards for NJPDES-DGW permits pursuant to N.J.A.C. 7:14A and remediation standards for the cleanup of ground water contamination sites pursuant to N.J.A.C. 7:26D and 26E. The GWQS themselves do not establish any recordkeeping or reporting requirements, or require the use of professional services for compliance. Small businesses may be affected through the administration of the NJPDES-DGW

Program and the Site Remediation and Waste Management Program to the extent that these businesses are regulated pursuant to these programs.

The NJPDES Program uses the GWQS to establish requirements for entities seeking to discharge wastewater through ground water disposal to ensure that the public health and the environment are adequately protected. These requirements are site-specific and based upon the volume of wastewater to be discharged, the contaminants present in the wastewater, and the disposal option, not the size of the business.

A small business responsible for conducting remediation for one of the ground water constituents for which the proposed ground water quality standard will be more stringent than the current standard might have to conduct additional remediation to comply with the new standard, including the associated recordkeeping and reporting requirements. However, the risk to public health posed by the contamination is the same whether or not the person responsible for conducting the remediation is a small business. Consequently, the Department's rules governing site remediation do not provide any reduction in cleanup requirements based on small business status, except that those small businesses that meet the definition in the New Jersey Regulatory Flexibility Act, as well as the definition of "small business" set forth in the Administrative Requirements for the Remediation of Contaminated Sites at N.J.A.C. 7:26C-1.3, are not required to post financial assurance when engineering controls are installed as part of a remedial action.

Housing Affordability Impact Analysis

In accordance with N.J.S.A. 52:14B-4, the Department has evaluated this rulemaking to determine the nature and extent of the impact, if any, of the proposed amendments to the GWQS

on the affordability of housing. The proposed amendments to the GWQS, which will ensure that current and scientifically based standards are in place for purposes of NJPDES-DGW permitting and ground water remediation, are extremely unlikely to evoke a change in the average costs associated with housing.

Smart Growth Development Impact Analysis

In accordance with N.J.S.A. 52:14B-4, the Department has evaluated this rulemaking to determine the impact, if any, of the proposed amendments to the GWQS on housing production in Planning Areas 1 or 2, or within designated centers, under the State Development and Redevelopment Plan. The proposed amendments to the GWQS, which will ensure that current and scientifically based standards are in place for purposes of NJPDES-DGW permitting and ground water remediation, are extremely unlikely to evoke a change in housing production in Planning Areas 1 or 2 or within designated centers.

Racial and Ethnic Community Criminal Justice and Public Safety Impact

The Department has evaluated this rulemaking and determined that it will not have an impact on pretrial detention, sentencing, probation, or parole policies concerning adults and juveniles in the State. Accordingly, no further analysis is required.

References

ATSDR. 1997. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Chlorpyrifos.

https://www.atsdr.cdc.gov/ToxProfiles/tp84.pdf

ATSDR. 2000. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Ethion.

https://www.atsdr.cdc.gov/ToxProfiles/tp152.pdf

ATSDR. 2006. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Dichlorobenzenes.

https://www.atsdr.cdc.gov/toxprofiles/tp10.pdf

ATSDR. 2010. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Ethylene Glycol.

https://www.atsdr.cdc.gov/ToxProfiles/tp96.pdf

ATSDR. 2012. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Cadmium.

https://www.atsdr.cdc.gov/ToxProfiles/tp5.pdf

CalEPA. 1999a. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment. Public Health Goal for 1,2-Dichloropropane in Drinking Water. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment.

https://oehha.ca.gov/media/downloads/water/public-health-goal/12dcpf.pdf

CalEPA. 1999b. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment. Public Health Goal for Heptachlor and Heptachlor Epoxide in Drinking Water.

https://oehha.ca.gov/media/downloads/water/public-health-goal/hepandox.pdf

CalEPA. 2010. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment. Public Health Goals for Chemicals in Drinking Water: Methoxychlor. https://oehha.ca.gov/media/downloads/water/chemicals/phg/091610mxc.pdf

Dieter, C.A., Maupin, M.A., Caldwell, R.R., Harris, M.A., Ivahnenko, T.I., Lovelace, J.K., Barber, N.L., and Linsey, K.S., 2018, Estimated use of water in the United States in 2015: U.S. Geological Survey Circular 1441, 65 p., https://doi.org/10.3133/cir1441. (Supersedes USGS Open-File Report 2017–1131.)

Draize, JH, Alvarez E, Whitesell MF, Woodard G, Hagan EC, and Nelson, AA. 1948. Toxicological investigations of compounds proposed for use as insect repellents: A. Local and systemic effects following topical skin application; B. Acute oral toxicity; C. Pathological examination. Journal of Pharmacology and Experimental Therapeutics 93:26–39.

HC. 2015. Health Canada. Guidelines for Canadian Drinking Water Quality. Guideline Technical Document: Toluene, Ethylbenzene and Xylenes. https://www.canada.ca/content/dam/canada/health-canada/migration/healthy-canadians/publications/healthy-living-vie-saine/water-toluene-eau/alt/water-toluene-eau-eng.pdf

Lehman, AJ. 1955. Insect repellents. Q. Bull. Assoc. Food Drug Off. 19:87-99.

NJDEP. 2004. New Jersey Department of Environmental Protection. Basis and Background for Criteria Derivation and Practical Quantitation Levels Ground Water Quality Standards Rule Recodification and Readoption with Amendments. N.J.A.C 7:9C. https://www.state.nj.us/dep/wms/bears/docs/gwqsbb2004.pdf

NJDEP. 2017. New Jersey Department of Environmental Protection. Basis and Background for Criteria Derivation and Practical Quantitation Levels. https://www.nj.gov/dep/rules/adoptions/adopt_20180116c-bb.pdf

NJDWQI. 1987a. New Jersey Drinking Water Quality Institute. Benzene Health-Based Maximum Contaminant Level Support Document. Appendix B, Section A. https://www.state.nj.us/dep/watersupply/pdf/append-b-section-a.pdf

NJDWQI. 1987b. New Jersey Drinking Water Quality Institute. Dichlorobenzene Health-Based Maximum Contaminant Level Support Document. Appendix B, Section E. https://www.state.nj.us/dep/watersupply/pdf/append-b-section-e.pdf

NJDWQI. 1987c. New Jersey Drinking Water Quality Institute. Dichloroethylenes Health-Based Maximum Contaminant Level Support Document. Appendix B, Section G. https://www.state.nj.us/dep/watersupply/pdf/append-b-section-g.pdf

NJDWQI. 1987d. New Jersey Drinking Water Quality Institute. Ethylene Glycol Health-Based Maximum Contaminant Level Support Document. Appendix B, Section H. https://www.nj.gov/dep/watersupply/pdf/append-b-section-h.pdf

NJDWQI. 1987e. New Jersey Drinking Water Quality Institute. 1,2,4-Trichlorobenzene Health-Based Maximum Contaminant Level Support Document. Appendix B, Section P. https://www.state.nj.us/dep/watersupply/pdf/append-b-section-p.pdf

NJDWQI. 1987f. New Jersey Drinking Water Quality Institute. 1,1,1-Trichloroethane Health-Based Maximum Contaminant Level Support Document. Appendix B, Section Q. https://www.state.nj.us/dep/watersupply/pdf/append-b-section-q.pdf

NJDWQI. 1994. New Jersey Drinking Water Quality Institute. Maximum Contaminant Level Recommendations for Hazardous Contaminants in Drinking Water. Appendix A, Health-Based Maximum Contaminant Level Support Documents and Addenda. https://www.nj.gov/dep/watersupply/pdf/1994-appendix.pdf

NJDWQI. 2009. New Jersey Drinking Water Quality Institute. Appendix A. Health Effects Subcommittee Report. https://www.nj.gov/dep/watersupply/pdf/gp_healthappendix_final_6.15.09_correctTOC.pdf

USEPA. 1980. United States Environmental Protection Agency. Ambient Water Quality Criteria for Phthalate Esters. Office of Water Regulations and Standards. EPA-440-5-80-067. https://www.epa.gov/sites/production/files/2019-03/documents/ambient-wqc-phthalateesters-1980.pdf

USEPA. 1985. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for Ethylbenzene; CASRN 100-41-4. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0051_summary.pdf

USEPA. 1986a. United States Environmental Protection Agency. Guidelines for Carcinogen Risk Assessment. (EPA/630/R-00/004). Washington, DC: Risk Assessment Forum. https://nepis.epa.gov/Exe/ZyPDF.cgi/30004TZX.PDF?Dockey=30004TZX.PDF

USEPA. 1986b. United States Environmental Protection Agency. Final Draft for the Drinking Water Criteria Document on Cadmium. Office of Drinking Water. https://ntrl.ntis.gov/NTRL/dashboard/searchResults.xhtml?searchQuery=PB89192140#

USEPA. 1987a. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for Heptachlor; CASRN 76-44-8. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0243_summary.pdf

USEPA. 1987b. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for Heptachlor epoxide; CASRN 1024-57-3. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0160_summary.pdf

USEPA. 1987c. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for Hexachlorobutadiene; CASRN 87-68-3. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0058_summary.pdf#nameddest=canceroral

USEPA. 1988a. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for p-Chloroaniline; CASRN 106-47-8. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0320_summary.pdf

USEPA. 1988b. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for p,p'-Dichlorodiphenyldichloroethylene (DDE); CASRN 72- 55-9. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0328_summary.pdf#nameddest=canceroral

USEPA. 1989a. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for Butyl Benzyl Phthalate; CASRN 85-68-7.

https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0293_summary.pdf#nameddest=rfd.

USEPA. 1989b. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for Cadmium; CASRN 7440-43-9. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0141_summary.pdf

USEPA. 1989c. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for 1,2-Dichlorobenzene; CASRN 95-50-1. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0408_summary.pdf

USEPA. 1989d. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary: Ethion; CASRN 563-12-2. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0156_summary.pdf

USEPA. 1989e. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for Ethylene glycol; CASRN 107-21-1. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0238_summary.pdf

USEPA. 1989f. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for Hexachlorobenzene; CASRN 118-74-1. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0374_summary.pdf

USEPA. 1990a. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for Bromoform; CASRN 75-25-2. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0214_summary.pdf#nameddest=canceroral.

USEPA. 1990b. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for Dibromochloromethane; CASRN 124-48-1. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0222_summary.pdf#nameddest=canceroral

USEPA. 1990c. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for 1,3-Dichlorobenzene; CASRN 95-50-1. https://iris.epa.gov/static/pdfs/0447_summary.pdf

USEPA. 1990d. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for Methoxychlor; CASRN 72-43-5. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0369_summary.pdf

USEPA. 1992a. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for Bromodichloromethane; CASRN 75-27-4. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0213_summary.pdf

USEPA. 1992b. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for 1,2,4-Trichlorobenzene; CASRN 120-82-1. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0119_summary.pdf

USEPA. 1996. United States Environmental Protection Agency. Proposed Guidelines for Carcinogen Risk Assessment. Risk Assessment Forum, Washington, DC. EPA-600-P-92-003C. http://nepis.epa.gov/Exe/ZyPDF.cgi/3000261D.PDF?Dockey=3000261D.PDF.

USEPA. 1997a. United States Environmental Protection Agency. Health Effects Assessment Summary Tables (HEAST).

https://nepis.epa.gov/Exe/ZyPDF.cgi/2000O0GZ.PDF?Dockey=2000O0GZ.PDF

USEPA. 1997b. United States Environmental Protection Agency. Reregistration Eligibility Decision (RED). p-Chloro-m-cresol. Office of Prevention, Pesticides and Toxic Substances. EPA-738-R-96-008.

https://archive.epa.gov/pesticides/reregistration/web/pdf/3046red.pdf

USEPA. 1998. United States Environmental Protection Agency. Carcinogenic Effects of Benzene: An Update. Office of Research and Development, Washington, DC. EPA-600-P-97-001F. https://ofmpub.epa.gov/eims/eimscomm.getfile?p_download_id=428659

USEPA. 1999a. United States Environmental Protection Agency. Extrapolation of the Benzene Inhalation Unit Risk Estimate to the Oral Route of Exposure. Office of Research and Development, Washington, DC. NCEA-W-0517. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/supdocs/benzsup.pdf

USEPA. 1999b. United States Environmental Protection Agency. Review Draft Guidelines for Carcinogen Risk Assessment. Risk Assessment Forum, Washington, DC. NCEA-F-0644. https://ofmpub.epa.gov/eims/eimscomm.getfile?p_download_id=437005

USEPA. 2000a. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for Benzene; CASRN 71-43-2. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0276_summary.pdf

USEPA. 2000b. United States Environmental Protection Agency. Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000) Documents. Office of Water, Office of Science and Technology, EPA-822-B-00-004.

https://www.epa.gov/sites/production/files/2018-10/documents/methodology-wqc-protection-hh-2000.pdf

USEPA. 2002a. United States Environmental Protection Agency. A Review of the Reference Dose and Reference Concentration Processes.

https://www.epa.gov/sites/production/files/2014-12/documents/rfd-final.pdf

USEPA. 2002b. United States Environmental Protection Agency. Provisional Peer-Reviewed Toxicity Values for Butyl benzyl phthalate (CASRN 85-68-7), Derivation of a Carcinogenicity Assessment.

https://hhpprtv.ornl.gov/issue_papers/Butylbenzylphthalate.pdf.

USEPA. 2003. United States Environmental Protection Agency. Health Effects Support Document for Hexachlorobutadiene. EPA-822-R-03-002. Office of Water, Washington, DC.

https://www.epa.gov/sites/production/files/2014-09/documents/support_cc1_hexachlorobutadiene_healtheffects.pdf

USEPA. 2005a. United States Environmental Protection Agency. Drinking Water Criteria Document for Brominated Trihalomethanes. EPA-822-R05-011. U.S. Environmental Protection Agency, Office of Water, Office of Science and Technology, Washington, DC.

https://nepis.epa.gov/Exe/ZyPDF.cgi/P1006GVD.PDF?Dockey=P1006GVD.PDF

USEPA. 2005b. United States Environmental Protection Agency. Guidelines for Carcinogen Risk Assessment. Risk Assessment Forum, Washington, DC. EPA/630/P-03/001F.

https://www.epa.gov/sites/production/files/2013-09/documents/cancer_guidelines_final_3-25-05.pdf

USEPA. 2006. United States Environmental Protection Agency. Provisional Peer-Reviewed Toxicity Values for 1,2-Dibromo-3-Chloropropane (CASRN 96-12-8). https://hhpprtv.ornl.gov/issue_papers/Dibromo3Chloropropane12.pdf

USEPA. 2007. United States Environmental Protection Agency. Integrated Risk Information System. Chemical Assessment Summary for 1,1,1-Trichloroethane; CASRN 71-55-6. https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0197_summary.pdf

USEPA. 2007. United States Environmental Protection Agency. Provisional Peer-Reviewed Toxicity Values for Dimethyl phthalate (CASRN 131-11-3). https://hhpprtv.ornl.gov/issue_papers/Dimethylphthalate.pdf

USEPA. 2008a. United States Environmental Protection Agency. Health Effects Support Document for 1,1-Dichloro-2,2-bis(p-chlorophenyl)ethylene (DDE). EPA-822-R-08-003. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/sites/production/files/2014-09/documents/health_effects_support_document_for_dde.pdf

USEPA. 2008b. United States Environmental Protection Agency. Office of Prevention, Pesticides and Toxic Substances. Reregistration Eligibility Decision for Pentachlorophenol. EPA 739-R-08-008.

https://nepis.epa.gov/Exe/ZyPDF.cgi/P1002CL2.PDF?Dockey=P1002CL2.PDF

USEPA. 2008c. United States Environmental Protection Agency. Provisional Peer-Reviewed Toxicity Values for Cobalt (CASRN 7440-48-4).

https://hhpprtv.ornl.gov/issue_papers/Cobalt.pdf

USEPA. 2008d. United States Environmental Protection Agency. Provisional Peer-Reviewed Toxicity Values for p-Chloroaniline (CASRN 106-47-8). https://hhpprtv.ornl.gov/issue_papers/Chloroanilinep.pdf

USEPA. 2009a. United States Environmental Protection Agency. Provisional Peer-Reviewed Toxicity Values for 4-Chloro-3-Methylphenol (p-Chloro-m-Cresol) (CASRN 59-50-7). https://hhpprtv.ornl.gov/issue_papers/Chloro3Methylphenol4pChloromcresol.pdf

USEPA. 2009b. United States Environmental Protection Agency. Provisional Peer-Reviewed Toxicity Values for 1,2,4-Trichlorobenzene (CASRN 120-82-1). https://hhpprtv.ornl.gov/issue_papers/Trichlorobenzene124.pdf

USEPA. 2012a. United States Environmental Protection Agency. Benchmark Dose Technical Guidance. https://www.epa.gov/sites/production/files/2015-01/documents/benchmark_dose_guidance.pdf

USEPA. 2012b. United States Environmental Protection Agency. Provisional Peer-Reviewed Toxicity Values for Di-n-octyl Phthalate (CASRN 117-84-0). https://hhpprtv.ornl.gov/issue_papers/OctylPhthalatediN.pdf

USEPA. 2015. United States Environmental Protection Agency. Office of Water. National Recommended Water Quality Criteria - Human Health Criteria Table. https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table

Full text of the proposal follows (additions indicated in boldface **thus**; deletions indicated in brackets [thus]):

CHAPTER 9C

GROUND WATER QUALITY STANDARDS

SUBCHAPTER 1. GROUND WATER QUALITY STANDARDS

7:9C-1.7 Ground water quality criteria

(a)-(b) (No change.)

(c) Ground water quality criteria for Class II-A areas are established as follows:

1.-2. (No change.)

3. The Department shall establish ground water quality criteria as follows:

i. If the Department promulgates in the Safe Drinking Water Act rules at N.J.A.C. 7:10 a maximum contaminant level (MCL) for a constituent, the health-based level used to establish the MCL shall be the specific ground water quality criterion for the constituent.

(1) If, subsequent to promulgation of an MCL for a constituent in accordance with (c)3i above, the Department determines, based on constituent-specific data, applicable USEPA guidance, generally accepted scientific evidence, and/or peer-reviewed sources of information, that a ground water criterion developed at (c)3ii below would more appropriately address the risk posed by the constituent than the health-based level used to establish the promulgated MCL, the Department shall establish the ground water quality criterion based on the weight of evidence approach at (c)3ii below.

ii. For all other constituents, the Department shall develop ground water quality criteria for Class II-A ground water based upon the weight of evidence available regarding each constituent's carcinogenicity, toxicity, public welfare**,** or organoleptic effects, as appropriate for the protection of potable water, pursuant to (c)4 below.

4. Except as provided at (c)4iv and v below, the Department shall use the equations, data sources, and conventions at (c)4i [through]**, ii, and** iii below to derive specific and interim specific ground water quality criteria:

i. For constituents categorized as carcinogens, the criteria shall be derived using the following equation:

$$\text{Criterion } (\mu g/L) = \frac{\text{Upper Bound Lifetime Excess Cancer Risk} \times \text{Average Adult Weight} \times \text{Conversion Factor}}{\text{Carcinogenic Slope Factor} \times \text{Assumed Daily Water Consumption}}$$

Where the default values are:

Average Adult Weight	=	[70] **80.0** kg
Assumed Daily Water Consumption	=	[two] **2.4** liters per day
Upper Bound Lifetime Excess Cancer Risk	=	1×10^{-6}
Conversion Factor	=	1,000 µg/mg

Carcinogenic Slope Factor = value from the United States Environmental Protection Agency (USEPA) Integrated Risk Information System (IRIS) data base, http://www.epa.gov/iris, incorporated herein by reference, as $(mg/kg/day)^{-1}$

ii. For constituents classified as non-carcinogens and for constituents classified as carcinogens for which no carcinogenic slope factor is available, the criterion shall be derived using the following equation:

$$\text{Criterion } (\mu g/L) = \frac{\text{Reference Dose} \times \text{Average Adult Weight} \times \text{Conversion Factor} \times \text{Relative Source Contribution}}{\text{Assumed Daily Water Consumption} \times \text{Uncertainty Factor}}$$

Where the default values are:

Average Adult Weight = [70] **80.0** kg

Relative Source Contribution = 20 percent

Assumed Daily Water Consumption	=	[two] **2.4** liters per day
Conversion Factor	=	1,000 µg/mg
Reference Dose	=	value from the USEPA IRIS data base, http://www.epa.gov/iris, incorporated herein by reference, as mg/kg/day
Uncertainty Factor	=	10 for carcinogens for which no carcinogenic slope factor is applicable; 1 for non-carcinogens

iii. The criteria derived by the equations in this paragraph shall be rounded to [one] **two** significant figure**s when all components of the equation are available in two or more significant figures. Otherwise, the final criteria shall be rounded to one significant figure**.

iv.-v. (No change.)

5. – 6. (No change.)

(d) – (i) (No change.)

7:9C-1.9 Constituent standard modifications and practical quantitation levels

(a)-(b) (No change.)

(c) Where a constituent standard (the criterion as adjusted by the antidegradation policy and applicable criteria exceptions) is of a lower concentration than the relevant PQL (in Appendix Table 1), the Department shall not (in the context of an applicable regulatory program) consider the discharge to be causing a contravention of that constituent standard**,** so long as the concentration of the constituent in the affected ground water is less than the relevant PQL.

1.-2. (No change.)

3. Selection and derivation of PQLs shall be as follows:

i. PQLs shall be rounded to [one] **two** significant figure**s** using standard methods.

ii. – iv. (No change.)

4. (No change.)

APPENDIX

Table 1

Specific Ground Water Quality Criteria – Class II-A and Practical Quantitation Levels

Constituent	**CASRN**	**Ground Water Quality Criterion***	**Practical Quantitation Level (PQL)***	**Higher of PQL and Ground Water Quality Criterion (ug/L)***
...				
Acrolein	107-02-8	4	[5] **4.4**	[5] **4.4**
Acrylamide	79-06-1	[0.008] **0.024**	0.2	0.2

Constituent	**CASRN**	**Ground Water Quality Criterion***	**Practical Quantitation Level (PQL)***	**Higher of PQL and Ground Water Quality Criterion (ug/L)***
...				
Aldrin	309-00-2	0.002	[0.04] **0.020**	[0.04] **0.020**
...				
Benz(a)anthracene	56-55-3	[0.05] **0.1**	0.1	[0.1] **0.1**
Benzene	71-43-2	[0.2] **0.12**	[1] **0.45**	[1] **0.45**
Benzidine	92-87-5	0.0002	[20] **6.6**	[20] **6.6**
Benzo(a)pyrene (BaP)	50-32-8	[0.005] **0.01**	0.1	0.1
Benzo(b)fluoranthene (3,4-Benzofluoranthene)	205-99-2	[0.05] **0.1**	0.2	0.2
Benzo(k)fluoranthene	207-08-9	[0.5] **1**	0.3	[0.5] **1**
...				
beta-BHC (beta-HCH)	319-85-7	0.02	[0.04] **0.020**	[0.04] **0.02**
...				
1,1-Biphenyl	92-52-4	[400] **4.1**	[10] **5.0**	[400] **5.0**
Bis(2-chloroethyl) ether	111-44-4	0.03	[7] **1.3**	[7] **1.3**
...				
Bromodichloromethane (Dichlorobromomethane)	75-27-4	[0.6] **0.98**	[1] **0.50**	[1] **0.98**

Constituent	**CASRN**	**Ground Water Quality Criterion***	**Practical Quantitation Level (PQL)***	**Higher of PQL and Ground Water Quality Criterion (ug/L)***
Bromoform	75-25-2	[4] **7.4**	0.8	[4] **7.4**
...				
Butylbenzyl phthalate	85-68-7	[100] **18**	1	[100] **18**
Cadmium	7440-43-9	[4] **0.92**	0.5	[4] **0.92**
...				
Chlordane	57-74-9	0.01	[0.5] **0.20**	[0.5] **0.20**
...				
4-Chloroaniline (p-Chloroaniline)	106-47-8	[30] **0.18**	[10] **5.0**	[30] **5.0**
4-Chloro-3-methylphenol (3-methyl-4-chlorophenol)	**59-50-7**	**700**	**0.18**	**700**
...				
Chlorpyrifos	2921-88-2	[20] **7**	0.1	[20] **7**
...				
Chrysene	218-01-9	[5] **10**	0.2	[5] **10**
Cobalt	7440-48-4	[100] **2**	[0.5] **0.45**	[100] **2**
...				
Cyanide (free Cyanide)	57-12-5	[100] **4.2**	[6] **5.0**	[100] **5.0**

Constituent	**CASRN**	**Ground Water Quality Criterion***	**Practical Quantitation Level (PQL)***	**Higher of PQL and Ground Water Quality Criterion (ug/L)***
...				
4,4'-DDE	72-55-9	[0.1] **0.20**	0.01	[0.1] **0.20**
...				
Dibenz(a,h)anthracene	53-70-3	[0.005] **0.01**	0.3	0.3
Dibromochloromethane (Chlorodibromomethane)	124-48-1	[0.4] **0.78**	[1] **0.75**	[1] **0.78**
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	[0.02] **0.016**	0.02	0.02
...				
1,2-Dichlorobenzene (ortho)	95-50-1	[600] **210**	5	[600] **210**
1,3-Dichlorobenzene (meta)	541-73-1	[600] **4.7**	5	[600] **5**
1,4-Dichlorobenzene (para)	106-46-7	[75] **15**	5	[75] **15**
3,3-Dichlorobenzidine	91-94-1	0.08	[30] **5.2**	[30] **5.2**
...				
1,1-Dichloroethane (1,1-DCA)	75-34-3	[50] **22**	1	[50] **22**
1,2-Dichloroethane	107-06-2	0.3	[2] **0.060**	[2] **0.3**
1,1-Dichloroethylene (1,1-DCE)	75-35-4	[1] **31**	1	[1] **31**
cis-1,2-Dichloroethylene	156-59-2	[70] **11**	1	[70] **11**

Constituent	**CASRN**	**Ground Water Quality Criterion***	**Practical Quantitation Level (PQL)***	**Higher of PQL and Ground Water Quality Criterion (ug/L)***
...				
1,2-Dichloropropane	78-87-5	[0.5] **0.92**	[1] **0.50**	[1] **0.92**
1,3-Dichloropropene (cis and trans)	542-75-6	0.4	[1] **0.45**	[1] **0.45**
Dieldrin	60-57-1	0.002	[0.03] **0.020**	[0.03] **0.020**
...				
Dimethyl phthalate	**131-11-3**	**20,000**	**0.29**	**20,000**
...				
2,4-Dinitrophenol	51-28-5	10	[40] **10**	[40] **10**
2,4-Dinitrotoluene/2,6-Dinitrotoluene Mix	25321-14-6	0.05	[10] **5.2**	[10] **5.2**
Di-n-octyl phthalate	117-84-0	[100] **80**	10	[100] **80**
...				
1,2-Diphenylhydrazine	122-66-7	0.04	[20] **2.2**	[20] **2.2**
...				
Ethion	563-12-2	[4] **3**	0.5	[4] **3**
...				
Ethylbenzene	100-41-4	[700] **150**	2	[700] **150**

Constituent	**CASRN**	**Ground Water Quality Criterion***	**Practical Quantitation Level (PQL)***	**Higher of PQL and Ground Water Quality Criterion (ug/L)***
...				
Ethylene glycol	107-21-1	[300] **5,100**	200	[300] **5,100**
...				
Heptachlor	76-44-8	[0.008] **0.0081**	[0.05] **0.020**	[0.05] **0.020**
Heptachlor epoxide	1024-57-3	[0.004] **0.0061**	[0.2] **0.020**	[0.2] **0.020**
Hexachlorobenzene	118-74-1	[0.02] **0.033**	0.02	[0.02] **0.033**
Hexachlorobutadiene	87-68-3	[0.4] **0.8**	1	1
...				
Hexachloroethane	67-72-1	[2] **0.8**	[7] **0.65**	[7] **0.8**
...				
Indeno (1,2,3-cd)pyrene	193-39-5	[0.05] **0.1**	0.2	0.2
...				
Methanol	67-56-1	[4,000] **13,000**	70	[4,000] **13,000**
Methoxychlor	2-43-5	[40] **0.1**	0.1	[40] **0.1**
...				
Methyl ethyl ketone (2-Butanone) (MEK)	78-93-3	[300] **4,300**	2	[300] **4,300**

Constituent	**CASRN**	**Ground Water Quality Criterion***	**Practical Quantitation Level (PQL)***	**Higher of PQL and Ground Water Quality Criterion (ug/L)***
Methylene chloride	75-09-2	[3] **6**	1	[3] **6**
...				
Nitrobenzene	98-95-3	[4] **1.2**	[6] **0.075**	[6] **1.2**
...				
N-Nitrosodi-n-propylamine (Di-n-propylnitrosamine)	621-64-7	0.005	[10] **1.6**	[10] **1.6**
...				
PCBs (Polychlorinated biphenyls)	1336-36-3	0.02	[0.5] **0.20**	[0.5] **0.20**
Pentachlorophenol	87-86-5	[0.3] **0.08**	0.1	[0.3] **0.1**
...				
Perfluorononanoic acid (PFNA)***	375-95-1	0.013	[0.005] **0.0025**	0.013
...				
1,1,2,2-Tetrachloroethane	79-34-5	[1] **0.2**	[1] **0.065**	[1] **0.2**
Tetrachloroethylene (PCE)	127-18-4	0.4	[1] **0.055**	[1] **0.4**
...				
Tetrahydrofuran	109-99-9	[10] **620**	10	[10] **620**
Thallium	7440-28-0	0.5	[2] **0.50**	[2] **0.5**

Constituent	**CASRN**	**Ground Water Quality Criterion***	**Practical Quantitation Level (PQL)***	**Higher of PQL and Ground Water Quality Criterion (ug/L)***
Toxaphene	8001-35-2	0.03	[2] **1.2**	[2] **1.2**
...				
1,2,4-Trichlorobenzene	120-82-1	[9] **1.1**	1	[9] **1.1**
1,1,1-Trichloroethane (TCA)	71-55-6	[30] **1,900**	1	[30] **1,900**
1,1,2-Trichloroethane	79-00-5	[3] **0.58**	[2] **0.24**	[3] **0.58**
...				
Trichloroethylene (TCE)	79-01-6	[1] **0.28**	[1] **0.10**	[1] **0.28**
...				
2,4,6-Trichlorophenol	88-06-2	[1] **3.0**	[20] **0.23**	[20] **3.0**
1,2,3-Trichloropropane (TCP)***	96-18-4	0.0005	[0.03] **0.0050**	[0.03] **0.0050**
...				
Vinyl chloride	75-01-4	[0.08] **0.022**	[1] **0.035**	[1] **0.035**
...				

Explanation of Terms:

*	=	Ground water quality criteria and PQLs are expressed as micrograms per liter (µg/L) unless otherwise noted. Table 1 criteria are all maximum values unless clearly indicated as a range for which the minimum value is to the left and the maximum
**	=	value is to the right.
***		
PQL	=	Practical quantitation level as defined [in] **at** N.J.A.C. 7:9C-1.4
CASRN	=	Chemical Abstracts [System Registration] **Service Registry** Number
NA	=	not available for this constituent
A	=	Asbestos criterion is measured in terms of fibers/liter longer than 10 micrometers (f/L >10 µm)
CU	=	Standard Cobalt Units
B	=	Threshold Odor Number
(Total)		means the concentration of metal in an unfiltered sample following treatment with hot dilute mineral acid (as defined in "Methods for Chemical Analysis of Water & Wastes," USEPA-600/4-79-020, March 1979) or other digestion defined by the analytical method. However**,** samples that contain less than 1 nephelometric turbidity unit (NTU) and are properly preserved, may be directly analyzed without digestion.

M = Pursuant to prevailing Safe Drinking Water Act rules, any positive result for fecal coliform is in violation of the MCL and is therefore an exceedance of the ground water quality criteria.

Where there is a decimal point after the ground water quality criterion or PQL, the zero, as well as the non-zero digits are considered significant.

CHAPTER 26D

REMEDIATION STANDARDS

SUBCHAPTER 7. UPDATING REMEDIATION STANDARDS

7:26D-7.2 Procedures for updating remediation standards

(a) (No change.)

(b) The Department shall update a soil and a soil leachate remediation standard for the migration to ground water exposure pathway at N.J.A.C. 7:26D Appendix 1 when a ground water quality criterion is updated pursuant to the Ground Water Quality Standards at N.J.A.C. 7:9C-1.7(c)[5].

(c) – (e) (No change.)