April 24, 2019

PFAS-Related revisions to the Massachusetts Contingency Plan ("MCP", 310 CMR 40.0000)

This document contains *just* the proposed regulations related to perfluoroalkyl and polyfluoroalkyl substances ("PFAS"), including proposed cleanup standards for soil and groundwater, toxicity values for use in site-specific risk assessment, and notification criteria for soil and groundwater.

For the full set of proposed changes to the MCP and the schedule for the Public Comment Period/Public Hearings,
see http://www.mass.gov/lists/2019-proposed-mcp-revisions

65. NOTE TO REVIEWERS: *Amendments are proposed to update MCP numerical cleanup standards and corresponding Reportable Concentration to reflect more recent scientific and technical information on chemical exposure and toxicity. Exposure factors such as body weight and skin surface area have been revised to reflect newer data, consistent with sources of information cited by EPA's 2011 Exposure Factors Handbook. Toxicity values (e.g. cancer slope factors and reference doses) used to calculate risk-based soil and groundwater concentrations have been revised to reflect changes in the values published on EPA's IRIS database as well as the results of MassDEP's Office of Research & Standards' (ORS's) reviews and analyses of recently published scientific literature and toxicity assessments. In addition, EPA's recommended procedures for taking into account early life sensitivity to mutagenic chemicals have been incorporated in the calculations for a number of standards. Finally, six perfluoroalkyl substances have been added to the Method 1 Standards list – Perfluorodecanoic Acid (PFDA), Perfluoroheptanoic (PFHpA), Perfluorohexanesulfonic Acid (PFHxS), Perfluorooctanoic Acid (PFOA), Perfluorooctane Sulfonate(PFOS) and Perfluorononanoic Acid (PFNA).*

Of particular note are the proposed GW-1 standards and RCGW-1 Reportable Concentrations for the per- and polyfluorinated compounds (PFAS). The proposed Method 1 GW-1 Standard – applicable to groundwater protected for its current and/or future use as drinking water – reflects an approach that is concurrently being considered for a revised MassDEP ORSG (drinking water guideline) used to evaluate public water supplies. The MCP GW-1 Standards are typically set equal to any existing Massachusetts drinking water standard or guideline to promote regulatory consistency. Any comments received apropos the proposed MCP GW-1 standard will also be considered by the Department in the revision of the ORSG.

As described in the supporting documentation, "Summary of Proposed MCP Method 1 Standards Revisions (2018)," the values differ from the published US EPA Drinking Water Health Advisory and the June 2018 MassDEP ORSG in several ways, in consideration of toxicological studies and analyses that have been published subsequently. (These new data are cited below and discussed in detail in the documentation for the proposed MCP standards.) First, the proposed GW-1 standard applies to the sum of the six PFAS listed above, while the EPA Health Advisory applies to the sum of two (PFOS and PFOA) and the ORSG applies to five PFAS. Second, MassDEP has incorporated an additional Uncertainty Factor in the Reference Dose (RfD) to account for evidence of PFAS toxicities at lower exposure levels. Thus the proposed GW-1 standard applies a limit of 20 ng/L (parts-per-trillion, or ppt) to the summed concentrations of six listed PFAS.

MassDEP recognizes that the available information, interpreted differently, could result in a different numerical limit and/or different approach to address the similar toxicity/mechanism of action for these compounds. The Department is particularly soliciting comments and supporting documentation on several aspects of the proposed PFAS standards:

- *Is the proposed revision of the EPA RfD through the inclusion of an additional Uncertainty Factor to account for more sensitive toxicity endpoints appropriate in light of the ATSDR draft MRLs and other data? Alternative approaches could also include adopting the federal EPA Reference Dose un-modified; including a higher UF of 10 (as done by ATSDR for PFOS and NJ DEP for PFOA); or selecting alternative endpoints in the RfD derivation. Are reviewers aware of other critical data not addressed in the USEPA (USEPA 2016 a,b,c,d); ATSDR (ATSDR 2018); NJ (NJ DWQI 2015, 2017, 2018); and NTP (2016) evaluations that MassDEP should consider in making these determinations?*

- *The GW-1 standard applies to the sum of the six PFAS noted above (one additional compound beyond those included in MassDEP's June 2018 ORSG).*
  - *In light of the dearth of toxicity, epidemiology and pharmacokinetic data on PFHpA and PFDA, should these compounds be included in this approach, excluded or treated separately? Should additional compounds be included and if so why?*
  - *The comparison of the sum of the PFAS concentrations to a single standard addresses the similar toxicity/mechanism of action of these compounds – similar to the 2,3,7,-TCDD (dioxin) standard. Alternatively, MassDEP could (a) promulgate chemical-specific for each PFAS, or (b) promulgate chemical-specific standards AND a cumulative (possibly higher) standard which would also have to be met (for example, the individual chemicals would have to be below 20ppt and the sum would have to be below 35 ppt).*

  MassDEP seeks comment on which PFAS should be summed, if any, and the target concentration for the summed and chemical-specific standards.

- *How should the GW-1 standard consider Relative Source Contribution? The target Hazard Index used to develop the Method 1 Standards is 0.2 to account for multiple chemical- and multiple pathway- exposures at and from 21E sites. PFAS has been described as "ubiquitous" in the environment, including exposures from common household products and foods. Is the assumption that 20% of a person's exposure comes from drinking water sufficiently protective?*

- *Comments regarding analytical issues relating to quantification thresholds and data reproducibility at the proposed low parts-per-trillion levels are also requested.*

The proposed amendments to the numerical standards, including the basis for each change, are summarized in the spreadsheet, "2018 MCP Standards Comparison.xlxs."

310 CMR 40.0974(2): **TABLE 1** ††

MCP Method 1 GROUNDWATER STANDARDS
APPLICABLE IN AREAS WHERE THE GROUNDWATER IS CONSIDERED TO BE ONE OR MORE OF THE FOLLOWING CATEGORIES PER 310 CMR 40.0932

Oil and/or Hazardous Material	CAS Number	GW-1 Standard ug/liter (ppb)	GW-2 Standard ug/liter (ppb)	GW-3 Standard ug/liter (ppb)
DIETHYL PHTHALATE	84-66-2	2,000	50,000	9,000
DIMETHYL PHTHALATE	131-11-3	300	50,000	50,000
DIMETHYLPHENOL, 2,4-	105-67-9	60	40,000	50,000
DINITROPHENOL, 2,4-	51-28-5	200	50,000	20,000
DINITROTOLUENE, 2,4-	121-14-2	30	20,000	50,000
DIOXANE, 1,4-	123-91-1	0.3	~~6,000~~5,000	50,000
ENDOSULFAN	115-29-7	10	NA	2
ENDRIN	72-20-8	2	NA	5
ETHYLBENZENE	100-41-4	700	20,000	5,000
ETHYLENE DIBROMIDE	106-93-4	0.02	2	50,000
FLUORANTHENE	206-44-0	90	NA	200
FLUORENE	86-73-7	~~30~~40	NA	40
HEPTACHLOR	76-44-8	0.4	2	1
HEPTACHLOR EPOXIDE	1024-57-3	0.2	7	2
HEXACHLOROBENZENE	118-74-1	1	1	6,000
HEXACHLOROBUTADIENE	87-68-3	0.6	50	3,000
HEXACHLOROCYCLOHEXANE, GAMMA (gamma-HCH)	58-89-9	0.2	200	4
HEXACHLOROETHANE	67-72-1	8	100	50,000
HMX	2691-41-0	200	50,000	50,000
INDENO(1,2,3-cd)PYRENE	193-39-5	0.5	NA	100
LEAD	7439-92-1	15	NA	10
MERCURY	7439-97-6	2	NA	20
METHOXYCHLOR	72-43-5	40	NA	10
METHYL ETHYL KETONE	78-93-3	4,000	50,000	50,000
METHYL ISOBUTYL KETONE	108-10-1	350	50,000	50,000
METHYL MERCURY	22967-92-6	0.3	NA	20
METHYL TERT BUTYL ETHER	1634-04-4	70	50,000	50,000
METHYLNAPHTHALENE, 2-	91-57-6	10	2,000	20,000
NAPHTHALENE	91-20-3	140	700	20,000
NICKEL	7440-02-0	100	NA	200
PENTACHLOROPHENOL	87-86-5	1	NA	200
PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) ***	-	0.02	NA	-
PERFLUORODECANOIC ACID (PFDA)	335-76-2	See PFAS	NA	40,000
PERFLUOROHEPTANOIC ACID (PFHpA)	375-85-9	See PFAS	NA	40,000
PERFLUOROHEXANESULFONIC ACID (PFHxS)	355-46-4	See PFAS	NA	500
PERFLUORONONANOIC ACID (PFNA)	375-95-1	See PFAS	NA	40,000
PERFLUOROOCTANESULFONIC ACID (PFOS)	1763-23-1	See PFAS	NA	500
PERFLUOROOCTANOIC ACID (PFOA)	335-67-1	See PFAS	NA	40,000
PERCHLORATE	-	2	NA	1,000
PETROLEUM HYDROCARBONS				
TOTAL PETROLEUM HYDROCARBON †	NA	200	5,000	5,000
ALIPHATIC HYDROCARBONS				
C5 through C8 Aliphatic Hydrocarbons	NA	300	3,000	50,000
C9 through C12 Aliphatic Hydrocarbons	NA	700	5,000	50,000
C9 through C18 Aliphatic Hydrocarbons	NA	700	5,000	50,000
C19 through C36 Aliphatic Hydrocarbons	NA	14,000	NA	50,000
AROMATIC HYDROCARBONS				
C9 through C10 Aromatic Hydrocarbons	NA	200	4,000	50,000
C11 through C22 Aromatic Hydrocarbons	NA	200	50,000	5,000
PHENANTHRENE	85-01-8	~~40~~50	NA	10,000
PHENOL	108-95-2	~~1,000~~900	50,000	2,000
POLYCHLORINATED BIPHENYLS (PCBs)	1336-36-3	0.5	5	10
PYRENE	129-00-0	~~60~~70	NA	20
RDX	121-82-4	1	50,000	50,000
SELENIUM	7782-49-2	50	NA	~~100~~50
SILVER	7440-22-4	100	NA	7
STYRENE	100-42-5	100	100	6,000
TETRACHLORODIBENZO-p-DIOXIN (TCDD), 2,3,7,8- (equivalents)	1746-01-6	3.E-05	NA	4.E-02
TETRACHLOROETHANE, 1,1,1,2-	630-20-6	5	10	50,000
TETRACHLOROETHANE, 1,1,2,2-	79-34-5	2	9	50,000

310 CMR 40.0974(2): **TABLE 1** ††

MCP Method 1 GROUNDWATER STANDARDS
APPLICABLE IN AREAS WHERE THE GROUNDWATER IS CONSIDERED TO BE ONE OR MORE OF THE FOLLOWING CATEGORIES PER 310 CMR 40.0932

Oil and/or Hazardous Material	CAS Number	GW-1 Standard ug/liter (ppb)	GW-2 Standard ug/liter (ppb)	GW-3 Standard ug/liter (ppb)
TETRACHLOROETHYLENE	127-18-4	5	~~50~~20	30,000
THALLIUM	7440-28-0	2	NA	3,000
TOLUENE	108-88-3	1,000	50,000	40,000
TRICHLOROBENZENE, 1,2,4-	120-82-1	70	200	50,000
TRICHLOROETHANE, 1,1,1-	71-55-6	200	4,000	20,000
TRICHLOROETHANE, 1,1,2-	79-00-5	5	900	50,000
TRICHLOROETHYLENE	79-01-6	5	5	5,000
TRICHLOROPHENOL, 2,4,5-	95-95-4	200	50,000	3,000
TRICHLOROPHENOL 2,4,6-	88-06-2	10	5,000	500
VANADIUM	7440-62-2	30	NA	4,000
VINYL CHLORIDE	75-01-4	2	2	50,000
XYLENES (Mixed Isomers)	1330-20-7	10,000	3,000	5,000
ZINC	7440-66-6	5,000	NA	900

NA - Not Applicable
* - The Total Chromium standard is applicable in the absence of species-specific data for Chromium III and Chromium VI.
** - Cyanide expressed as Physiologically Available Cyanide (PAC). In the absence of measured Physiologically Available Cyanide, the standard is applicable to Total Cyanide.
*** - The Per- and Polyfluoroalkyl Substances (PFAS) standard shall be compared to the sum of the concentrations of the following PFAS: perfluorodecanoic acid (PFDA), perfluoroheptanoic acid (PFHpA), perfluorohexanesulfonic acid (PFHxS), perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), and perfluorononanoic acid (PFNA). The listed compounds and associated CAS numbers are for the acid forms of these PFAS compounds. The information presented in Table 1 are also applicable to the respective anionic forms of these compounds. These anions may form salts with any of a number of cations resulting in a variety of possible chemical species, each having a unique CAS number.
† - The Total Petroleum Hydrocarbon (TPH) standard may be used as an alternative to the appropriate combinations of the Aliphatic and Aromatic Hydrocarbon Fraction standards. The use of the general TPH standard is a valid option only for C9 and greater petroleum hydrocarbons; it is not appropriate for the characterization of risks associated with lighter (gasoline-range) hydrocarbons.
†† - The Department periodically reviews the scientific basis for these Standards and amends them, as appropriate, to incorporate new scientific information.

40.0975: Identification of Applicable Soil Standards in Method 1

The MCP Method 1 Soil Standards consider both the potential risk of harm resulting from direct exposure to the oil and/or hazardous material in the soil and the potential impacts on the groundwater at the disposal site. The applicability of a specific numerical Standard is thus a function of both the soil and the groundwater category identified:

(1) The category of soil (S-1, S-2, or S-3) at each Exposure Point determines which one of the three tables of MCP Method 1 Soil Standards is applicable.

(2) The category of groundwater (GW-1, GW-2, and/or GW-3) at or near each Exposure Point determines which column of the applicable MCP Method 1 Soil Standards table are relevant to the soil at the Exposure Point. If more than one groundwater category is applicable at the disposal site, then multiple MCP Method 1 Soil Standards may be applicable to the soil of interest, and the lowest of those identified standards shall be selected to characterize the risk of harm.

(3) The MCP Method 1 Soil Standards listed in Table 2 in 310 CMR 40.0975(6)(a) are applicable to soil determined to be category S-1.

(4) The MCP Method 1 Soil Standards listed in Table 3 in 310 CMR 40.0975(6)(b) are applicable to soil determined to be category S-2.

(5) The MCP Method 1 Soil Standards listed in Table 4 in 310 CMR 40.0975(6)(c) are applicable to soil determined to be category S-3.

310 CMR 40.0975(6)(a): **TABLE 2** ††

MCP Method 1: SOIL CATEGORY S-1 STANDARDS
APPLICABLE TO SOIL WHERE THE COMBINATION OF SOIL & GROUNDWATER CATEGORIES ARE:

Oil and/or Hazardous Material	CAS Number	S-1 SOIL & GW-1 ug/g (ppm)	S-1 SOIL & GW-2 ug/g (ppm)	S-1 SOIL & GW-3 ug/g (ppm)
DICHLOROETHANE, 1,1-	75-34-3	0.4	9	500
DICHLOROETHANE, 1,2-	107-06-2	0.1	0.1	~~20~~30
DICHLOROETHYLENE, 1,1-	75-35-4	3	40	500
DICHLOROETHYLENE, CIS-1,2-	156-59-2	0.3	0.1	100
DICHLOROETHYLENE, TRANS-1,2-	156-60-5	1	1	500
DICHLOROMETHANE	75-09-2	0.1	~~4~~3	~~400~~300
DICHLOROPHENOL, 2,4-	120-83-2	0.7	~~60~~70	40
DICHLOROPROPANE, 1,2-	78-87-5	0.1	0.1	~~30~~60
DICHLOROPROPENE, 1,3-	542-75-6	0.01	0.4	20
DIELDRIN	60-57-1	~~0.08~~0.09	~~0.08~~0.09	~~0.08~~0.09
DIETHYL PHTHALATE	84-66-2	10	200	300
DIMETHYL PHTHALATE	131-11-3	0.7	50	600
DIMETHYLPHENOL, 2,4-	105-67-9	0.7	100	500
DINITROPHENOL, 2,4-	51-28-5	3	50	50
DINITROTOLUENE, 2,4-	121-14-2	0.7	2	2
DIOXANE, 1,4-	123-91-1	0.2	~~6~~5	20
ENDOSULFAN	115-29-7	~~0.5~~0.6	300	1
ENDRIN	72-20-8	~~10~~20	~~10~~20	~~10~~20
ETHYLBENZENE	100-41-4	40	500	500
ETHYLENE DIBROMIDE	106-93-4	0.1	0.1	1
FLUORANTHENE	206-44-0	1,000	1,000	1,000
FLUORENE	86-73-7	1,000	1,000	1,000
HEPTACHLOR	76-44-8	0.3	0.3	0.3
HEPTACHLOR EPOXIDE	1024-57-3	~~0.1~~0.2	~~0.1~~0.2	~~0.1~~0.2
HEXACHLOROBENZENE	118-74-1	0.7	0.7	0.7
HEXACHLOROBUTADIENE	87-68-3	30	30	30
HEXACHLOROCYCLOHEXANE, GAMMA (gamma-HCH)	58-89-9	0.003	~~1~~2	0.5
HEXACHLOROETHANE	67-72-1	0.7	3	50
HMX	2691-41-0	2	100	1,000
INDENO(1,2,3-cd)PYRENE	193-39-5	~~7~~20	~~7~~20	~~7~~20
LEAD	7439-92-1	200	200	200
MERCURY	7439-97-6	20	20	20
METHOXYCHLOR	72-43-5	~~200~~300	~~200~~300	~~200~~300
METHYL ETHYL KETONE	78-93-3	4	50	400
METHYL ISOBUTYL KETONE	108-10-1	0.4	50	400
METHYL MERCURY	22967-92-6	~~4~~5	~~4~~5	~~4~~5
METHYL TERT BUTYL ETHER	1634-04-4	0.1	100	100
METHYLNAPHTHALENE, 2-	91-57-6	0.7	80	300
NAPHTHALENE	91-20-3	4	20	500
NICKEL	7440-02-0	~~600~~700	~~600~~700	~~600~~700
PENTACHLOROPHENOL	87-86-5	3	3	3
PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) ***	-	0.0002	-	-
PEFLUORODECANOIC ACID (PFDA)	335-76-2	See PFAS	0.3	0.3
PERFLUOROHEPTANOIC ACID (PFHpA)	375-85-9	See PFAS	0.3	0.3
PERFLUOROHEXANESULFONIC ACID (PFHxS)	355-46-4	See PFAS	0.3	0.3
PERFLUORONONANOIC ACID (PFNA)	375-95-1	See PFAS	0.3	0.3
PERFLUOROOCTANESULFONIC ACID (PFOS)	1763-23-1	See PFAS	0.3	0.3
PERFLUOROOCTANOIC ACID (PFOA)	335-67-1	See PFAS	0.3	0.3
PERCHLORATE	-	0.1	~~3~~4	~~3~~4

310 CMR 40.0975(6)(a): **TABLE 2** ††

MCP Method 1: SOIL CATEGORY S-1 STANDARDS
APPLICABLE TO SOIL WHERE THE COMBINATION OF SOIL & GROUNDWATER CATEGORIES ARE:

Oil and/or Hazardous Material	CAS Number	S-1 SOIL & GW-1 ug/g (ppm)	S-1 SOIL & GW-2 ug/g (ppm)	S-1 SOIL & GW-3 ug/g (ppm)
PETROLEUM HYDROCARBONS				
TOTAL PETROLEUM HYDROCARBON †	NA	1,000	1,000	1,000
ALIPHATIC HYDROCARBONS				
C5 through C8 Aliphatic Hydrocarbons	NA	100	100	100
C9 through C12 Aliphatic Hydrocarbons	NA	1,000	1,000	1,000
C9 through C18 Aliphatic Hydrocarbons	NA	1,000	1,000	1,000
C19 through C36 Aliphatic Hydrocarbons	NA	3,000	3,000	3,000
AROMATIC HYDROCARBONS				
C9 through C10 Aromatic Hydrocarbons	NA	100	100	100
C11 through C22 Aromatic Hydrocarbons	NA	1,000	1,000	1,000
PHENANTHRENE	85-01-8	10	500	500
PHENOL	108-95-2	~~1~~0.9	50	20
POLYCHLORINATED BIPHENYLS (PCBs)	1336-36-3	1	1	1
PYRENE	129-00-0	1,000	1,000	1,000
RDX	121-82-4	1	20	20
SELENIUM	7782-49-2	400	400	400
SILVER	7440-22-4	100	100	100
STYRENE	100-42-5	3	4	~~7~~80
TETRACHLORODIBENZO-p-DIOXIN (TCDD), 2,3,7,8- (equivalents)	1746-01-6	2.E-05	2.E-05	2.E-05
TETRACHLOROETHANE, 1,1,1,2-	630-20-6	0.1	0.1	~~8~~090
TETRACHLOROETHANE, 1,1,2,2-	79-34-5	0.005	0.02	10
TETRACHLOROETHYLENE	127-18-4	1	~~1~~04	~~3~~0100
THALLIUM	7440-28-0	8	8	8
TOLUENE	108-88-3	30	500	500
TRICHLOROBENZENE, 1,2,4-	120-82-1	2	6	700
TRICHLOROETHANE, 1,1,1-	71-55-6	30	500	500
TRICHLOROETHANE, 1,1,2-	79-00-5	0.1	2	40
TRICHLOROETHYLENE	79-01-6	0.3	0.3	30
TRICHLOROPHENOL, 2,4,5-	95-95-4	4	1,000	600
TRICHLOROPHENOL 2,4,6-	88-06-2	0.7	20	20
VANADIUM	7440-62-2	~~400~~500	~~400~~500	~~400~~500
VINYL CHLORIDE	75-01-4	~~0.9~~0.3	~~0.7~~0.3	~~1~~0.3
XYLENES (Mixed Isomers)	1330-20-7	400	100	500
ZINC	7440-66-6	1,000	1,000	1,000

NOTE: All concentrations of oil and/or hazardous material in soil are calculated and presented on a dry weight/dry weight basis.
NA - Not Applicable
* - The Total Chromium standard is applicable in the absence of species-specific data for Chromium III and Chromium VI.
** - Cyanide expressed as Physiologically Available Cyanide (PAC). In the absence of measured Physiologically Available Cyanide, the standard is applicable to Total Cyanide.
*** - The Per- and Polyfluoroalkyl Substances (PFAS) standard shall be compared to the sum of the concentrations of the following PFAS: perfluorodecanoic acid (PFDA), perfluoroheptanoic acid (PFHpA), perfluorohexanesulfonic acid (PFHxS), perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), and perfluorononanoic acid (PFNA). The listed compounds and associated CAS numbers are for the acid forms of these PFAS compounds. The information presented in Table 2 are also applicable to the respective anionic forms of these compounds. These anions may form salts with any of a number of cations resulting in a variety of possible chemical species, each having a unique CAS number.
† - The Total Petroleum Hydrocarbon (TPH) standard may be used as an alternative to the appropriate combinations of the Aliphatic and Aromatic Hydrocarbon Fraction standards. The use of the general TPH standard is a valid option only for C9 and greater petroleum hydrocarbons; it is not appropriate for the characterization of risks associated with lighter (gasoline-range) hydrocarbons.
†† - The Department periodically reviews the scientific basis for these Standards and amends them, as appropriate, to incorporate new scientific information.

310 CMR 40.0975(6)(b): **TABLE 3** ††

MCP Method 1: SOIL CATEGORY S-2 STANDARDS
APPLICABLE TO SOIL WHERE THE COMBINATION OF SOIL & GROUNDWATER CATEGORIES ARE:

Oil and/or Hazardous Material	CAS Number	S-2 SOIL & GW-1 ug/g (ppm)	S-2 SOIL & GW-2 ug/g (ppm)	S-2 SOIL & GW-3 ug/g (ppm)
DICHLOROMETHANE	75-09-2	0.1	~~4~~3	~~700~~800
DICHLOROPHENOL, 2,4-	120-83-2	0.7	~~60~~70	40
DICHLOROPROPANE, 1,2-	78-87-5	0.1	0.1	~~100~~300
DICHLOROPROPENE, 1,3-	542-75-6	0.01	0.4	~~90~~100
DIELDRIN	60-57-1	~~0.5~~0.6	~~0.5~~0.6	~~0.5~~0.6
DIETHYL PHTHALATE	84-66-2	10	200	300
DIMETHYL PHTHALATE	131-11-3	0.7	50	600
DIMETHYLPHENOL, 2,4-	105-67-9	0.7	100	1,000
DINITROPHENOL, 2,4-	51-28-5	3	50	100
DINITROTOLUENE, 2,4-	121-14-2	0.7	10	10
DIOXANE, 1-4-	123-91-1	0.2	~~6~~5	~~90~~100
ENDOSULFAN	115-29-7	~~0.5~~0.6	500	1
ENDRIN	72-20-8	~~20~~30	~~20~~30	~~20~~30
ETHYLBENZENE	100-41-4	40	1,000	1,000
ETHYLENE DIBROMIDE	106-93-4	0.1	0.1	5
FLUORANTHENE	206-44-0	3,000	3,000	3,000
FLUORENE	86-73-7	3,000	3,000	3,000
HEPTACHLOR	76-44-8	2	2	2
HEPTACHLOR EPOXIDE	1024-57-3	~~0.9~~1	~~0.9~~1	~~0.9~~1
HEXACHLOROBENZENE	118-74-1	~~0.8~~0.9	~~0.8~~0.9	~~0.8~~0.9
HEXACHLOROBUTADIENE	87-68-3	100	100	100
HEXACHLOROCYCLOHEXANE, GAMMA (gamma-HCH)	58-89-9	0.003	2	0.5
HEXACHLOROETHANE	67-72-1	0.7	3	~~200~~300
HMX	2691-41-0	2	100	1,000
INDENO(1,2,3-cd)PYRENE	193-39-5	~~40~~300	~~40~~300	~~40~~300
LEAD	7439-92-1	600	600	600
MERCURY	7439-97-6	~~30~~40	~~30~~40	~~30~~40
METHOXYCHLOR	72-43-5	400	400	400
METHYL ETHYL KETONE	78-93-3	4	50	400
METHYL ISOBUTYL KETONE	108-10-1	0.4	50	400
METHYL MERCURY	22967-92-6	~~8~~9	~~8~~9	~~8~~9
METHYL TERT BUTYL ETHER	1634-04-4	0.1	100	500
METHYLNAPHTHALENE, 2-	91-57-6	1	80	500
NAPHTHALENE	91-20-3	4	20	1,000
NICKEL	7440-02-0	1,000	1,000	1,000
PENTACHLOROPHENOL	87-86-5	3	20	10
PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) ***	-	0.0002	-	-
PERFLUORODECANOIC ACID (PFDA)	335-76-2	See PFAS	0.4	0.4
PERFLUOROHEPTANOIC ACID (PFHpA)	375-85-9	See PFAS	0.4	0.4
PERFLUOROHEXANESULFONIC ACID (PFHxS)	355-46-6	See PFAS	0.4	0.4
PERFLUORONONANOIC ACID (PFNA)	375-95-1	See PFAS	0.4	0.4
PERFLUOROOCTANESULFONIC ACID (PFOS)	1763-23-1	See PFAS	0.4	0.4
PERFLUOROOCTANOIC ACID (PFOA)	335-67-1	See PFAS	0.4	0.4
PERCHLORATE	-	0.1	~~5~~6	~~5~~6
PETROLEUM HYDROCARBONS				
TOTAL PETROLEUM HYDROCARBON †	NA	1,000	3,000	3,000
ALIPHATIC HYDROCARBONS				
C5 through C8 Aliphatic Hydrocarbons	NA	500	500	500
C9 through C12 Aliphatic Hydrocarbons	NA	3,000	3,000	3,000
C9 through C18 Aliphatic Hydrocarbons	NA	3,000	3,000	3,000
C19 through C36 Aliphatic Hydrocarbons	NA	5,000	5,000	5,000
AROMATIC HYDROCARBONS				
C9 through C10 Aromatic Hydrocarbons	NA	300	500	500

310 CMR 40.0975(6)(b): **TABLE 3** ††

MCP Method 1: SOIL CATEGORY S-2 STANDARDS
APPLICABLE TO SOIL WHERE THE COMBINATION OF SOIL & GROUNDWATER CATEGORIES ARE:

Oil and/or Hazardous Material	CAS Number	S-2 SOIL & GW-1 ug/g (ppm)	S-2 SOIL & GW-2 ug/g (ppm)	S-2 SOIL & GW-3 ug/g (ppm)
C11 through C22 Aromatic Hydrocarbons	NA	1,000	3,000	3,000
PHENANTHRENE	85-01-8	20	1,000	1,000
PHENOL	108-95-2	~~1~~0.9	50	20
POLYCHLORINATED BIPHENYLS (PCBs)	1336-36-3	4	4	4
PYRENE	129-00-0	3,000	3,000	3,000
RDX	121-82-4	1	~~80~~90	~~80~~90
SELENIUM	7782-49-2	~~700~~800	~~700~~800	~~700~~800
SILVER	7440-22-4	200	200	200
STYRENE	100-42-5	3	4	300
TETRACHLORODIBENZO-p-DIOXIN (TCDD), 2,3,7,8- (equivalents)	1746-01-6	~~5~~6.E-05	~~5~~6.E-05	~~5~~6.E-05
TETRACHLOROETHANE, 1,1,1,2-	630-20-6	0.1	0.1	400
TETRACHLOROETHANE, 1,1,2,2-	79-34-5	0.005	0.02	50
TETRACHLOROETHYLENE	127-18-4	1	~~10~~4	~~200~~500
THALLIUM	7440-28-0	~~60~~70	~~60~~70	~~60~~70
TOLUENE	108-88-3	30	1,000	1,000
TRICHLOROBENZENE, 1,2,4-	120-82-1	2	6	3,000
TRICHLOROETHANE, 1,1,1-	71-55-6	30	600	1,000
TRICHLOROETHANE, 1,1,2-	79-00-5	0.1	2	200
TRICHLOROETHYLENE	79-01-6	0.3	0.3	~~60~~70
TRICHLOROPHENOL, 2,4,5-	95-95-4	4	1,000	600
TRICHLOROPHENOL 2,4,6-	88-06-2	0.7	20	20
VANADIUM	7440-62-2	~~700~~800	~~700~~800	~~700~~800
VINYL CHLORIDE	75-01-4	0.9	0.7	~~7~~10
XYLENES (Mixed Isomers)	1330-20-7	400	100	1,000
ZINC	7440-66-6	3,000	3,000	3,000

NOTE: All concentrations of oil and/or hazardous material in soil are calculated and presented on a dry weight/dry weight basis.
NA- Not Applicable
* - The Total Chromium standard is applicable in the absence of species-specific data for Chromium III and Chromium VI.
** - Cyanide expressed as Physiologically Available Cyanide (PAC). In the absence of measured Physiologically Available Cyanide, the standard is applicable to Total Cyanide.
*** - The Per- and Polyfluoroalkyl Substances (PFAS) standard shall be compared to the sum of the concentrations of the following PFAS: perfluorodecanoic acid (PFDA), perfluorodecanoic acid (PFDA), perfluoroheptanoic acid (PFHpA), perfluorohexanesulfonic acid (PFHxS), perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), and perfluorononanoic acid (PFNA). The listed compounds and associated CAS numbers are for the acid forms of these PFAS compounds. The information presented in Table 3 are also applicable to the respective anionic forms of these compounds. These anions may form salts with any of a number of cations resulting in a variety of possible chemical species, each having a unique CAS number.
† - The Total Petroleum Hydrocarbon (TPH) standard may be used as an alternative to the appropriate combinations of the Aliphatic and Aromatic Hydrocarbon Fraction standards. The use of the general TPH standard is a valid option only for C9 and greater petroleum hydrocarbons; it is not appropriate for the characterization of risks associated with lighter (gasoline-range) hydrocarbons.
†† - The Department periodically reviews the scientific basis for these Standards and amends them, as appropriate, to incorporate new scientific information.

310 CMR 40.0975(6)(c): **TABLE 4** ††

MCP Method 1: SOIL CATEGORY S-3 STANDARDS
APPLICABLE TO SOIL WHERE THE COMBINATION OF SOIL & GROUNDWATER CATEGORIES ARE:

Oil and/or Hazardous Material	CAS Number	S-3 SOIL & GW-1 ug/g (ppm)	S-3 SOIL & GW-2 ug/g (ppm)	S-3 SOIL & GW-3 ug/g (ppm)
DICHLOROMETHANE	75-09-2	0.1	~~4~~3	~~700~~800
DICHLOROPHENOL, 2,4-	120-83-2	0.7	~~60~~70	40
DICHLOROPROPANE, 1,2-	78-87-5	0.1	0.1	1,000
DICHLOROPROPENE, 1,3-	542-75-6	0.01	0.4	100
DIELDRIN	60-57-1	~~3~~4	~~3~~4	~~3~~4
DIETHYL PHTHALATE	84-66-2	10	200	300
DIMETHYL PHTHALATE	131-11-3	0.7	50	600
DIMETHYLPHENOL, 2,4-	105-67-9	0.7	100	1,000
DINITROPHENOL, 2,4-	51-28-5	3	50	100
DINITROTOLUENE, 2,4-	121-14-2	0.7	50	~~80~~90
DIOXANE, 1,4-	123-91-1	0.2	~~6~~5	500
ENDOSULFAN	115-29-7	0.~~5~~6	500	1
ENDRIN	72-20-8	~~20~~30	~~20~~30	~~20~~30
ETHYLBENZENE	100-41-4	40	1,000	3,000
ETHYLENE DIBROMIDE	106-93-4	0.1	0.1	~~40~~50
FLUORANTHENE	206-44-0	5,000	5,000	5,000
FLUORENE	86-73-7	5,000	5,000	5,000
HEPTACHLOR	76-44-8	10	10	10
HEPTACHLOR EPOXIDE	1024-57-3	1	1	1
HEXACHLOROBENZENE	118-74-1	~~0.8~~0.9	~~0.8~~0.9	~~0.8~~0.9
HEXACHLOROBUTADIENE	87-68-3	100	100	100
HEXACHLOROCYCLOHEXANE, GAMMA (gamma-HCH)	58-89-9	0.003	2	0.5
HEXACHLOROETHANE	67-72-1	0.7	3	~~200~~300
HMX	2691-41-0	2	100	1,000
INDENO(1,2,3-cd)PYRENE	193-39-5	~~300~~2,000	~~300~~2,000	~~300~~2,000
LEAD	7439-92-1	600	600	600
MERCURY	7439-97-6	~~30~~40	~~30~~40	~~30~~40
METHOXYCHLOR	72-43-5	400	400	400
METHYL ETHYL KETONE	78-93-3	4	50	400
METHYL ISOBUTYL KETONE	108-10-1	0.4	50	400
METHYL MERCURY	22967-92-6	~~8~~9	~~8~~9	~~8~~9
METHYL TERT BUTYL ETHER	1634-04-4	0.1	100	500
METHYLNAPHTHALENE, 2-	91-57-6	1	80	500
NAPHTHALENE	91-20-3	4	20	3,000
NICKEL	7440-02-0	1,000	1,000	1,000
PENTACHLOROPHENOL	87-86-5	3	~~70~~80	10
PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) ***	-	0.0002	NA	-
PERFLUORODECANOIC ACID (PFDA)	335-76-2	See PFAS	0.4	0.4
PERFLUOROHEPTANOIC ACID (PFHpA)	375-85-9	See PFAS	0.4	0.4
PERFLUOROHEXANESULFONIC ACID (PFHxS)	355-46-4	See PFAS	0.4	0.4
PERFLUORONONANOIC ACID (PFNA)	375-95-1	See PFAS	0.4	0.4
PERFLUOROOCTANESULFONIC ACID (PFOS)	1763-23-1	See PFAS	0.4	0.4
PERFLUOROOCTANOIC ACID (PFOA)	335-67-1	See PFAS	0.4	0.4
PERCHLORATE	-	0.1	~~5~~6	~~5~~6
PETROLEUM HYDROCARBONS				
TOTAL PETROLEUM HYDROCARBON †	NA	1,000	5,000	5,000
ALIPHATIC HYDROCARBONS				
C5 through C8 Aliphatic Hydrocarbons	NA	500	500	500
C9 through C12 Aliphatic Hydrocarbons	NA	5,000	5,000	5,000
C9 through C18 Aliphatic Hydrocarbons	NA	5,000	5,000	5,000
C19 through C36 Aliphatic Hydrocarbons	NA	5,000	5,000	5,000
AROMATIC HYDROCARBONS				

310 CMR 40.0975(6)(c): **TABLE 4** ††

MCP Method 1: SOIL CATEGORY S-3 STANDARDS
APPLICABLE TO SOIL WHERE THE COMBINATION OF SOIL & GROUNDWATER CATEGORIES ARE:

Oil and/or Hazardous Material	CAS Number	S-3 SOIL & GW-1 ug/g (ppm)	S-3 SOIL & GW-2 ug/g (ppm)	S-3 SOIL & GW-3 ug/g (ppm)
C9 through C10 Aromatic Hydrocarbons	NA	300	500	500
C11 through C22 Aromatic Hydrocarbons	NA	1,000	5,000	5,000
PHENANTHRENE	85-01-8	20	3,000	3,000
PHENOL	108-95-2	~~1~~0.9	50	20
POLYCHLORINATED BIPHENYLS (PCBs)	1336-36-3	4	4	4
PYRENE	129-00-0	5,000	5,000	5,000
RDX	121-82-4	1	100	400
SELENIUM	7782-49-2	~~700~~800	~~700~~800	~~700~~800
SILVER	7440-22-4	200	200	200
STYRENE	100-42-5	3	4	2,000
TETRACHLORODIBENZO-p-DIOXIN (TCDD), 2,3,7,8- (equivalents)	1746-01-6	~~5~~6.E-05	~~5~~6.E-05	~~5~~6.E-05
TETRACHLOROETHANE, 1,1,1,2-	630-20-6	0.1	0.1	500
TETRACHLOROETHANE, 1,1,2,2-	79-34-5	0.005	0.02	~~400~~500
TETRACHLOROETHYLENE	127-18-4	1	~~1~~04	~~1,000~~800
THALLIUM	7440-28-0	~~8~~090	~~8~~090	~~8~~090
TOLUENE	108-88-3	30	2,000	3,000
TRICHLOROBENZENE, 1,2,4-	120-82-1	2	6	5,000
TRICHLOROETHANE, 1,1,1-	71-55-6	30	600	3,000
TRICHLOROETHANE, 1,1,2-	79-00-5	0.1	2	500
TRICHLOROETHYLENE	79-01-6	0.3	0.3	~~6~~070
TRICHLOROPHENOL, 2,4,5-	95-95-4	4	1,000	600
TRICHLOROPHENOL 2,4,6-	88-06-2	0.7	20	20
VANADIUM	7440-62-2	~~700~~800	~~700~~800	~~700~~800
VINYL CHLORIDE	75-01-4	0.9	0.7	~~6~~0100
XYLENES (Mixed Isomers)	1330-20-7	400	100	3,000
ZINC	7440-66-6	5,000	5,000	5,000

NOTE: All concentrations of oil and/or hazardous material in soil are calculated and presented on a dry weight/dry weight basis.
NA- Not Applicable
* - The Total Chromium standard is applicable in the absence of species-specific data for Chromium III and Chromium VI.
** - Cyanide expressed as Physiologically Available Cyanide (PAC). In the absence of measured Physiologically Available Cyanide, the standard is applicable to Total Cyanide.
- The Per- and Polyfluoroalkyl Substances (PFAS) standard shall be compared to the sum of the concentrations of the following PFAS: perfluorodecanoic acid (PFDA), perfluoroheptanoic acid (PFHpA), perfluorohexanesulfonic acid (PFHxS), perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), and perfluorononanoic acid (PFNA). The listed compounds and associated CAS numbers are for the acid forms of these PFAS compounds. The information presented in Table 4 are also applicable to the respective anionic forms of these compounds. These anions may form salts with any of a number of cations resulting in a variety of possible chemical species, each having a unique CAS number.
† - The Total Petroleum Hydrocarbon (TPH) standard may be used as an alternative to the appropriate combinations of the Aliphatic and Aromatic Hydrocarbon Fraction standards. The use of the general TPH standard is a valid option only for C9 and greater petroleum hydrocarbons; it is not appropriate for the characterization of risks associated with lighter (gasoline-range) hydrocarbons.
†† - The Department periodically reviews the scientific basis for these Standards and amends them, as appropriate, to incorporate new scientific information.

310 CMR 40.0985(6): **TABLE 5** ††

MCP Method 2: DIRECT CONTACT EXPOSURE-BASED SOIL CONCENTRATIONS APPLICABLE TO THE SPECIFIED SOIL CATEGORY.

Oil and/or Hazardous Material	CAS Number	Soil Category S-1 ug/g (ppm)	Soil Category S-2 ug/g (ppm)	Soil Category S-3 ug/g (ppm)
DICHLOROPROPANE, 1,2-	78-87-5	~~30~~60	~~100~~300	1,000
DICHLOROPROPENE, 1,3-	542-75-6	20	~~90~~100	~~900~~1,000
DIELDRIN	60-57-1	~~0.08~~0.09	~~0.5~~0.6	~~3~~4
DIETHYL PHTHALATE	84-66-2	1,000	3,000	5,000
DIMETHYL PHTHALATE	131-11-3	1,000	3,000	5,000
DIMETHYLPHENOL, 2,4-	105-67-9	500	2,000	2,000
DINITROPHENOL, 2,4-	51-28-5	50	~~800~~900	~~800~~900
DINITROTOLUENE, 2,4-	121-14-2	2	10	~~8~~90
DIOXANE, 1,4-	123-91-1	20	~~90~~100	500
ENDOSULFAN	115-29-7	300	500	500
ENDRIN	72-20-8	~~1~~020	~~2~~030	~~2~~030
ETHYLBENZENE	100-41-4	500	1,000	3,000
ETHYLENE DIBROMIDE	106-93-4	1	5	~~4~~050
FLUORANTHENE	206-44-0	1,000	3,000	5,000
FLUORENE	86-73-7	1,000	3,000	5,000
HEPTACHLOR	76-44-8	0.3	2	10
HEPTACHLOR EPOXIDE	1024-57-3	~~0.1~~0.2	~~0.9~~1	1
HEXACHLOROBENZENE	118-74-1	0.7	~~0.8~~0.9	~~0.8~~0.9
HEXACHLOROBUTADIENE	87-68-3	30	100	100
HEXACHLOROCYCLOHEXANE, GAMMA (gamma-HCH)	58-89-9	~~1~~2	~~7~~8	~~60~~70
HEXACHLOROETHANE	67-72-1	50	~~200~~300	~~200~~300
HMX	2691-41-0	1,000	3,000	5,000
INDENO(1,2,3-cd)PYRENE	193-39-5	~~7~~20	~~40~~300	~~300~~2,000
LEAD	7439-92-1	200	600	600
MERCURY	7439-97-6	20	~~30~~40	~~30~~40
METHOXYCHLOR	72-43-5	~~200~~300	400	400
METHYL ETHYL KETONE	78-93-3	500	1,000	3,000
METHYL ISOBUTYL KETONE	108-10-1	500	1,000	3,000
METHYL MERCURY	22967-92-6	~~4~~5	~~8~~9	~~8~~9
METHYL TERT BUTYL ETHER	1634-04-4	100	500	500
METHYLNAPHTHALENE, 2-	91-57-6	300	500	500
NAPHTHALENE	91-20-3	500	1,000	3,000
NICKEL	7440-02-0	~~600~~700	1,000	1,000
PENTACHLOROPHENOL	87-86-5	3	20	~~7~~80
PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)***				
PERFLUORODECANOIC ACID (PFDA)	335-76-2	0.3	0.4	0.4
PERFLUOROHEPTANOIC ACID (PFHpA)	375-85-9	0.3	0.4	0.4
PERFLUOROHEXANESULFONIC ACID (PFHxS)	355-46-4	0.3	0.4	0.4
PERFLUORONONANOIC ACID (PFNA)	375-95-1	0.3	0.4	0.4
PERFLUOROOCTANESULFONIC ACID (PFOS)	1763-23-1	0.3	0.4	0.4
PERFLUOROOCTANOIC ACID (PFOA)	335-67-1	0.3	0.4	0.4
PERCHLORATE	NA	~~3~~4	~~5~~6	~~5~~6
PETROLEUM HYDROCARBONS				
TOTAL PETROLEUM HYDROCARBON †	NA	1,000	3,000	5,000
ALIPHATIC HYDROCARBONS				
C5 through C8 Aliphatic Hydrocarbons	NA	100	500	500
C9 through C12 Aliphatic Hydrocarbons	NA	1,000	3,000	5,000
C9 through C18 Aliphatic Hydrocarbons	NA	1,000	3,000	5,000
C19 through C36 Aliphatic Hydrocarbons	NA	3,000	5,000	5,000
AROMATIC HYDROCARBONS				
C9 through C10 Aromatic Hydrocarbons	NA	100	500	500
C11 through C22 Aromatic Hydrocarbons	NA	1,000	3,000	5,000

310 CMR 40.0985(6): **TABLE 5** ††

MCP Method 2: DIRECT CONTACT EXPOSURE-BASED SOIL CONCENTRATIONS APPLICABLE TO THE SPECIFIED SOIL CATEGORY.

Oil and/or Hazardous Material	CAS Number	Soil Category S-1 ug/g (ppm)	Soil Category S-2 ug/g (ppm)	Soil Category S-3 ug/g (ppm)
PHENANTHRENE	85-01-8	500	1,000	3,000
PHENOL	108-95-2	500	1,000	3,000
POLYCHLORINATED BIPHENYLS (PCBs)	1336-36-3	1	4	4
PYRENE	129-00-0	1,000	3,000	5,000
RDX	121-82-4	20	~~80~~90	400
SELENIUM	7782-49-2	400	~~700~~800	~~700~~800
SILVER	7440-22-4	100	200	200
STYRENE	100-42-5	~~70~~80	300	3,000
TETRACHLORODIBENZO-p-DIOXIN (TCDD), 2,3,7,8- (equivalents)	1746-01-6	2.E-05	~~5~~6.E-05	~~5~~6.E-05
TETRACHLOROETHANE, 1,1,1,2-	630-20-6	~~80~~90	400	500
TETRACHLOROETHANE, 1,1,2,2-	79-34-5	10	50	~~400~~500
TETRACHLOROETHYLENE	127-18-4	~~30~~100	~~200~~500	~~1000~~800
THALLIUM	7440-28-0	8	~~60~~70	~~80~~90
TOLUENE	108-88-3	500	1,000	3,000
TRICHLOROBENZENE, 1,2,4-	120-82-1	700	3,000	5,000
TRICHLOROETHANE, 1,1,1-	71-55-6	500	1,000	3,000
TRICHLOROETHANE, 1,1,2-	79-00-5	40	200	500
TRICHLOROETHYLENE	79-01-6	30	~~60~~70	~~60~~70
TRICHLOROPHENOL, 2,4,5-	95-95-4	1,000	3,000	5,000
TRICHLOROPHENOL 2,4,6-	88-06-2	~~20~~30	400	400
VANADIUM	7440-62-2	~~400~~500	~~700~~800	~~700~~800
VINYL CHLORIDE	75-01-4	~~1~~0.3	~~7~~10	~~60~~100
XYLENES (Mixed Isomers)	1330-20-7	500	1,000	3,000
ZINC	7440-66-6	1,000	3,000	5,000

NOTE: All concentrations of oil and/or hazardous material in soil are calculated and presented on a dry weight/dry weight basis.

NA - Not Applicable

* - The Total Chromium standard is applicable in the absence of species-specific data for Chromium III and Chromium VI.

** - Cyanide expressed as Physiologically Available Cyanide (PAC). In the absence of measured Physiologically Available Cyanide, the standard is applicable to Total Cyanide.

*** - The listed compounds and associated CAS numbers are for the acid forms of these PFAS compounds. The information presented in Table 5 are also applicable to the respective anionic forms of these compounds. These anions may form salts with any of a number of cations resulting in a variety of possible chemical species, each having a unique CAS number.

† - The Total Petroleum Hydrocarbon (TPH) standard may be used as an alternative to the appropriate combinations of the Aliphatic and Aromatic Hydrocarbon Fraction standards. The use of the general TPH standard is a valid option only for C9 and greater petroleum hydrocarbons; it is not appropriate for the characterization of risks associated with lighter (gasoline-range) hydrocarbons.

†† - The Department periodically reviews the scientific basis for these Standards and amends them, as appropriate, to incorporate new scientific information.

40.0986: Determination of Method 2 GW-2 Standards.

(1) MCP Method 1 GW-2 Standards consider the potential for oil and/or hazardous material to volatilize from the groundwater and migrate to indoor air. These standards may be modified under Method 2, or a determination may be made that one or more GW-2 standards are not applicable, based upon site-specific conditions. Modifications of a standard will result in a proposed MCP Method 2 GW-2 Standard. Proposed Method 2 standards or the determination that one or more GW-2 standards are not applicable shall be scientifically justified and sufficiently documented to demonstrate that the Response Action Performance Standard, described in 310 CMR 40.0191 has been met.

(2) An MCP Method 2 GW-2 Standard shall be protective of migration of oil and/or hazardous

40.0992: General Approach to Method 3

Method 3 relies upon detailed information about the site, the oil and/or hazardous material, and potential exposures to Human and Environmental Receptors under all current and reasonably foreseeable Site Activities and Uses to characterize the risk of harm. The scope and level of effort of the Method 3 Risk Characterization shall reflect the site-specific nature of this Method, and the information used to characterize the risk shall be sufficiently documented to demonstrate that the Response Action Performance Standard, described in 310 CMR 40.0191, has been met.

(1) The Method 3 Risk Characterization shall be performed in a manner consistent with scientifically acceptable risk assessment practices, and consider guidance published by the Department and EPA.

(2) In performing a Method 3 Risk Characterization, the objective shall be to provide a conservative estimate of the impact that the oil and/or hazardous material may have on the Human and Environmental Receptors at the disposal site and in the surrounding environment.

(3) This Risk Characterization process makes use of existing standards, Upper Concentration Limits in Groundwater and Soil, quantitative estimates of cancer and noncancer health risks, and both quantitative and qualitative evaluations of risk to public welfare and the environment to determine the need for a remedial action or to demonstrate that a condition of No Significant Risk exists or has been achieved.

(a) The Method 3 characterization of the risk of harm to human health is described in 310 CMR 40.0993.

(b) The Method 3 characterization of the risk of harm to public welfare is described in 310 CMR 40.0994.

(c) The Method 3 characterization of the risk of harm to the environment is described in 310 CMR 40.0995.

(d) The list of Upper Concentration Limits in Groundwater and Soil is in 310 CMR 40.0996(~~6~~8).

(4) The risk of harm to safety shall also be characterized, as described in 310 CMR 40.0960.

66. NOTE TO REVIEWERS: *The proposed revisions at 40.0993(3) is intended to clarify that the requirements of 310 CMR 22 for the evaluation of drinking water in public water supplies includes both numerical water quality standards and procedural requirements that must be met even when the assessment is being conducted as part of an MCP site. This section (310 CMR 40.0993(3)) ensures that MCP cleanups at a minimum meet the requirements of other regulatory programs whenever there is jurisdictional overlap. For Public Water Supplies, the decision as to whether water is acceptable for potable use is based on a combination of listed standards and site-specific risk assessment. The proposed change specifically cites the drinking water provisions for site-specific risk assessment so that the MCP Method 3 assessment will also meet the drinking water requirements, resulting in the same approach and result regardless of the regulatory program taking the lead. This consistency is important for specific types of contamination – such as PFAS in drinking water – where the drinking water program approach may differ from the generic MCP risk assessment process.*

67. NOTE TO REVIEWERS: *The proposed revisions at 40.0993(7) and 40.0993(8) specify requirements for identifying toxicity values for Method 3 risk characterization, including requiring the use of values developed by MassDEP listed in 310 CMR 40.0993(7).*

40.0993: Method 3 Human Health Risk Characterization

Under Method 3, the risk of harm to human health shall be characterized for all current and reasonably foreseeable Site Activities and Uses identified in 310 CMR 40.0923, as follows:

(1) The site, receptor and exposure information described in 310 CMR 40.0901 through 40.0920 shall be identified and documented.

(2) The groundwater and soil categories applicable to the disposal site shall be identified and documented, as described in 310 CMR 40.0930. The groundwater and soil categories shall be considered as general indicators of exposure potential in a Method 3 evaluation.

(3) All applicable or suitably analogous health standards shall be identified in the documentation of the Method 3 Risk Characterization. The MCP Method 1 Groundwater and Soil Standards listed in 310 CMR 40.0970 are not considered applicable or suitably analogous, as those standards represent an alternative approach to Method 3. The list of potentially applicable or suitably analogous standards

includes, but is not limited to:

(a) Massachusetts Drinking Water Quality Standards promulgated in 310 CMR 22.00: *Drinking Water*, including the requirements described at 310 CMR 22.03(8), which are considered applicable to all category GW-1 groundwater;

(b) Massachusetts Air Quality Standards promulgated in 310 CMR 6.00: *Ambient Air Quality Standards for the Commonwealth of Massachusetts*; and

(c) Massachusetts Surface Water Quality Standards promulgated in 314 CMR 4.00: *Massachusetts Surface Water Quality Standards*.

40.0993: continued

(4) The frequency, duration and intensity of exposure to each oil and/or hazardous material at the disposal site for each receptor at each Exposure Point shall be determined and documented, considering the current and reasonably foreseeable Site Activities and Uses identified for the disposal site. The magnitude of each receptor's total exposure to the oil and/or hazardous material at the disposal site is calculated in a manner which provides a conservative estimate of the potential exposures. Assessments conducted using a probabilistic analysis shall identify the 95th percentile estimate of each receptor's potential exposure.

(5) For each identified Human Receptor, cumulative cancer risks and cumulative non-cancer risks shall be calculated.

(a) Chemical-specific toxicity information used to estimate the cancer and non-cancer risks shall be identified and documented, and the selection of this information shall take into account standards and guidance published by the Department. Primary consideration shall be given to information developed by the Massachusetts Department of Environmental Protection for the purpose of conducting such risk assessments. Examples of such toxicity information include:

1. Reference Doses and Reference Concentrations; and
2. Carcinogenic Slope Factors and Unit Risks values.

~~(b) For receptors who may be exposed to mixtures of oil and/or hazardous material, or through multiple Exposure Pathways at the disposal site, the cumulative risk shall reflect those exposures. Risk estimates are presumed to be additive unless an alternative mechanism is demonstrated to be appropriate.~~

~~(c) Risk calculations performed using a probabilistic analysis shall identify the cumulative cancer and non-cancer risks associated with the 95th percentile estimate of exposure.~~

(6) When identifying toxicity values for use in a Method 3 Risk Characterization, toxicity values developed by MassDEP shall be used.

(a) For perchlorate, a chronic and subchronic reference dose of 7E-5 mg/(kg-day).
(b) For methyl tert-butyl ether, a chronic RfD of 1E-1 mg/(kg-day).
(c) For methyl tert-butyl ether, a subchronic RfD of 1E0 mg/(kg-day).
(d) For tetrachloroethylene, an oral cancer slope factor of 2E-2 per mg/(kg-day).
(e) For tetrachloroethylene, an inhalation unit risk of 3E-6 per ug/cubic meter.
(f) For the sum of the following per- and polyfluoroalkyl substances (PFAS), a chronic and subchronic reference dose of 5E-6 mg/kg/day:

1. Perfluorodecanoic acid (PFDA);
2. Perfluoroheptanoic acid (PFHpA);
3. Perfluorohexanesulfonic acid (PFHxS);
4. Perfluorononanoic acid (PFNA);
5. Perfluorooctanesulfonic acid (PFOS); and
6. Perfluorooctanoic acid (PFOA).

(7) If an applicable toxicity value is not listed at 310 CMR 40.0993(6), technical justification for the value selected must be provided. Preferential consideration shall be given to sources of toxicity values in accordance with the following hierarchy:

(a) Toxicity values adopted and otherwise published by MassDEP;
(b) Toxicity values listed in EPA's Integrated Risk Information System (IRIS) database; and
(c) Other EPA and non-EPA sources, including but not limited to EPA Provisional Peer Reviewed Toxicity Values (PPRTVs); Minimum Risk Levels (MRLs) published by U.S. Agency for Toxic Substances and Disease Registry (ATSDR); and values published by California Environmental Protection Agency. In selecting a source for a toxicity value, there should be a preference for toxicity assessments that are informed by current scientific information and account for the most sensitive endpoints.

(8) For receptors who may be exposed to mixtures of oil and/or hazardous material, or through multiple Exposure Pathways at the disposal site, the cumulative risk shall reflect those multiple exposures. Risk estimates are presumed to be additive unless an alternative mechanism is demonstrated to be appropriate.

(9) Risk calculations performed using a probabilistic analysis shall identify the cumulative cancer and non-cancer risks associated with the 95th percentile estimate of exposure.

(~~6~~10) The Cumulative Receptor Cancer Risks shall be compared to a Cumulative Cancer Risk Limit

310 CMR 40.0996(68): **TABLE 6** ††

MCP Method 3: UPPER CONCENTRATION LIMITS (UCLs) IN GROUNDWATER AND SOIL

Oil and/or Hazardous Material	CAS Number	UCLs IN GROUNDWATER ug/L (ppb)	UCLs IN SOIL ug/g (ppm)
DICHLOROMETHANE	75-09-2	100,000	~~7,000~~8,000
DICHLOROPHENOL, 2,4-	120-83-2	100,000	~~8,000~~9,000
DICHLOROPROPANE, 1,2-	78-87-5	100,000	10,000
DICHLOROPROPENE, 1,3-	542-75-6	2,000	~~9,000~~10,000
DIELDRIN	60-57-1	80	~~30~~40
DIETHYL PHTHALATE	84-66-2	100,000	10,000
DIMETHYL PHTHALATE	131-11-3	100,000	10,000
DIMETHYLPHENOL, 2,4-	105-67-9	100,000	10,000
DINITROPHENOL, 2,4-	51-28-5	100,000	~~8,000~~9,000
DINITROTOLUENE, 2,4-	121-14-2	100,000	~~800~~900
DIOXANE, 1,4-	123-91-1	100,000	5,000
ENDOSULFAN	115-29-7	100	5,000
ENDRIN	72-20-8	50	~~200~~300
ETHYLBENZENE	100-41-4	100,000	10,000
ETHYLENE DIBROMIDE	106-93-4	100,000	~~400~~500
FLUORANTHENE	206-44-0	2,000	10,000
FLUORENE	86-73-7	400	10,000
HEPTACHLOR	76-44-8	20	100
HEPTACHLOR EPOXIDE	1024-57-3	70	10
HEXACHLOROBENZENE	118-74-1	60,000	~~8~~9
HEXACHLOROBUTADIENE	87-68-3	30,000	1,000
HEXACHLOROCYCLOHEXANE, GAMMA (gamma-HCH)	58-89-9	2,000	~~600~~700
HEXACHLOROETHANE	67-72-1	100,000	~~2,000~~3,000
HMX	2691-41-0	100,000	10,000
INDENO(1,2,3-cd)PYRENE	193-39-5	1,000	~~3,000~~10,000
LEAD	7439-92-1	150	6,000
MERCURY	7439-97-6	200	~~300~~400
METHOXYCHLOR	72-43-5	400	4,000
METHYL ETHYL KETONE	78-93-3	100,000	10,000
METHYL ISOBUTYL KETONE	108-10-1	100,000	10,000
METHYL MERCURY	22967-92-6	200	~~80~~90
METHYL TERT BUTYL ETHER	1634-04-4	100,000	5,000
METHYLNAPHTHALENE, 2-	91-57-6	100,000	5,000
NAPHTHALENE	91-20-3	100,000	10,000
NICKEL	7440-02-0	2,000	10,000
PENTACHLOROPHENOL	87-86-5	2,000	~~700~~800
PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)***			
PERFLUORODECANOIC ACID (PFDA)	335-76-2	100,000	4
PERFLUOROHEPTANOIC ACID (PFHpA)	375-85-9	100,000	4
PERFLUOROHEXANESULFONIC ACID (PFHxS)	355-46-4	5,000	4
PERFLUORONONANOIC ACID (PFNA)	375-95-1	100,000	4
PERFLUOROOCTANESULFONIC ACID (PFOS)	1763-23-1	5,000	4
PERFLUOROOCTANOIC ACID (PFOA)	335-67-1	100,000	4
PERCHLORATE	-	10,000	~~50~~60
PETROLEUM HYDROCARBONS			
TOTAL PETROLEUM HYDROCARBON †	NA	50,000	10,000
ALIPHATIC HYDROCARBONS			
C5 through C8 Aliphatic Hydrocarbons	NA	100,000	5,000
C9 through C12 Aliphatic Hydrocarbons	NA	100,000	20,000
C9 through C18 Aliphatic Hydrocarbons	NA	100,000	20,000
C19 through C36 Aliphatic Hydrocarbons	NA	100,000	20,000
AROMATIC HYDROCARBONS			
C9 through C10 Aromatic Hydrocarbons	NA	100,000	5,000

310 CMR 40.0996(68): **TABLE 6** ††

MCP Method 3: UPPER CONCENTRATION LIMITS (UCLs) IN GROUNDWATER AND SOIL

Oil and/or Hazardous Material	CAS Number	UCLs IN GROUNDWATER ug/L (ppb)	UCLs IN SOIL ug/g (ppm)
C11 through C22 Aromatic Hydrocarbons	NA	100,000	10,000
PHENANTHRENE	85-01-8	100,000	10,000
PHENOL	108-95-2	100,000	10,000
POLYCHLORINATED BIPHENYLS (PCBs)	1336-36-3	100	100
PYRENE	129-00-0	~~600~~700	10,000
RDX	121-82-4	100,000	4,000
SELENIUM	7782-49-2	~~1,000~~500	~~7,000~~8,000
SILVER	7440-22-4	1,000	2,000
STYRENE	100-42-5	60,000	10,000
TETRACHLORODIBENZO-p-DIOXIN (TCDD), 2,3,7,8- (equivalents)	1746-01-6	4.E-01	~~5~~6.E-04
TETRACHLOROETHANE, 1,1,1,2-	630-20-6	100,000	5,000
TETRACHLOROETHANE, 1,1,2,2-	79-34-5	100,000	~~4,000~~5,000
TETRACHLOROETHYLENE	127-18-4	100,000	~~10,000~~8,000
THALLIUM	7440-28-0	30,000	~~800~~900
TOLUENE	108-88-3	100,000	10,000
TRICHLOROBENZENE, 1,2,4-	120-82-1	100,000	10,000
TRICHLOROETHANE, 1,1,1-	71-55-6	100,000	10,000
TRICHLOROETHANE, 1,1,2-	79-00-5	100,000	5,000
TRICHLOROETHYLENE	79-01-6	50,000	~~600~~700
TRICHLOROPHENOL, 2,4,5-	95-95-4	100,000	10,000
TRICHLOROPHENOL 2,4,6-	88-06-2	50,000	4,000
VANADIUM	7440-62-2	40,000	~~7,000~~8,000
VINYL CHLORIDE	75-01-4	100,000	~~600~~1,000
XYLENES (Mixed Isomers)	1330-20-7	100,000	10,000
ZINC	7440-66-6	50,000	10,000

NOTE: All concentrations of oil and/or hazardous material in soil are calculated and presented on a dry weight/dry weight basis.

NA - Not Applicable

* - The Total Chromium standard is applicable in the absence of species-specific data for Chromium III and Chromium VI.

** - Cyanide expressed as Physiologically Available Cyanide (PAC). In the absence of measured Physiologically Available Cyanide, the standard is applicable to Total Cyanide.

*** - The listed compounds and associated CAS numbers are for the acid forms of these PFAS compounds. The information presented in Table 6 are also applicable to the respective anionic forms of these compounds. These anions may form salts with any of a number of cations resulting in a variety of possible chemical species, each having a unique CAS number.

† - The Total Petroleum Hydrocarbon (TPH) standard may be used as an alternative to the appropriate combinations of the Aliphatic and Aromatic Hydrocarbon Fraction standards. The use of the general TPH standard is a valid option only for C9 and greater petroleum hydrocarbons; it is not appropriate for the characterization of risks associated with lighter (gasoline-range) hydrocarbons.

†† - The Department periodically reviews the scientific basis for these Standards and amends them, as appropriate, to incorporate new scientific information.

SUBPART J: PERMANENT AND TEMPORARY SOLUTIONS

40.1000: Permanent and Temporary Solutions

310 CMR 40.1001 through 40.1099 shall be cited collectively as 310 CMR 40.1000.

40.1001: Purpose

(1) 310 CMR 40.1000 establishes requirements and procedures for:
(a) determining when the response actions taken at a site where there has been a release or threat of release of oil and/or hazardous material to the environment are sufficient to meet the requirements of a Permanent or Temporary Solution;
(b) implementing Activity and Use Limitations;

MASSACHUSETTS OIL AND HAZARDOUS MATERIAL LIST
TABLE 1 ALPHABETICAL ORDER

CHEMICAL NAME	CAS NUM.	DEP RQ (Pounds)	NAME SOURCES	Reportable Concentrations GW1 (mg/l)	GW2 (mg/l)	S1 (mg/kg)	S2 (mg/kg)
2-PENTENE, 3,4,4-TRIMETHYL-	00598-96-9	50	7,6	5	50	500	5000
2,4-PENTENEDIONE	00123-54-6	100	7,6	10	100	1000	10000
PENTYL ACETATE	00628-63-7	100	6,1,3	10	100	1000	10000
PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) (sum of constituents listed below)				2E-05			
PERFLUORODECANOIC ACID (PFDA)	335-76-2	1		see PFAS	40	0.0002	0.4
PERFLUOROHEPTANOIC ACID (PFHpA)	375-85-9	1		see PFAS	40	0.0002	0.4
PERFLUOROHEXANESULFONIC ACID (PFHxS)	355-46-4	1		see PFAS	0.5	0.0002	0.4
PERFLUORONONANOIC ACID (PFNA)	375-95-1	1		see PFAS	40	0.0002	0.4
PERFLUOROOCTANESULFONIC ACID (PFOS)	1763-23-1	1		see PFAS	0.5	0.0002	0.4
PERFLUOROOCTANOIC ACID (PFOA)	335-67-1	1		see PFAS	40	0.0002	0.4
PERACETIC ACID	00079-21-0	1	4,6,8,1	0.1	1	10	100
PERCHLORATE COMPOUNDS, NOS		10	6,10.002	1	0.1	~~5~~6	
PERCHLORIC ACID	07601-90-3	10	6,1,7	(See RCs of any listed constituents)			
PERCHLOROETHYLENE	127-18-4	10	1,3,5,6,8	0.005	0.0~~25~~	1	~~104~~
PERCHLOROMETHYL MERCAPTAN	00594-42-3	10	6,1,2,3,4	1	10	100	1000
PERFLUOROISOBUTYLENE	00382-21-8	1	6	0.1	1	10	100
PERMANGANATE OF POTASH	07722-64-7	10	1,3,6	(See RCs of any listed constituents)			
PERMANGANIC ACID (HMnO4), POTASSIUM SALT	07722-64-7	10	7,1,3,6	(See RCs of any listed constituents)			
PERMETHRIN	52645-53-1	1	6	0.1	1	10	100
PEROXIDE, BIS(1,1-DIMETHYLETHYL)-	00110-05-4	10	7,1,6	1	10	100	1000
PEROXIDE, DIACETYL-	00110-22-5	10	7,1,6	1	10	100	1000
PEROXIDE, DIBENZOYL	00094-36-0	10	7,1,6,8	1	10	100	1000
PEROXYACETIC ACID	00079-21-0	1	1,6,4,8	0.1	1	10	100
PETROLEUM BASED OIL (DEP RQ in gallons)		10	5	(See TPH RC and RCs of other relevant constituents)			
PETROLEUM DISTILLATES	08030-30-6	10	6,1,5	(See TPH RC and RCs of other relevant constituents)			
PETROLEUM ETHER	08030-30-6	10	6,1,5	(See TPH RC and RCs of other relevant constituents)			
PETROLEUM HYDROCARBONS							
TOTAL PETROLEUM HYDROCARBONS (TPH) (DEP RQ in gallons)		10	5	0.2	5	1000	3000
ALIPHATIC HYDROCARBONS							
C_5 through C_8 Aliphatic Hydrocarbons				0.3	3	100	500
C_9 through C_{12} Aliphatic Hydrocarbons				0.7	5	1000	3000
C_9 through C_{18} Aliphatic Hydrocarbons				0.7	5	1000	3000
C_{19} through C_{36} Aliphatic Hydrocarbons				14	50	3000	5000

* Names Sources: 1 = DOT; 2 = RCRA; 3 = CERCLA HSL; 4 = SARA EHSL; 5 = DEP; 6 = MSL; 7 = 9CI; 8 = RTK