

# Maine Cleanup Standards for Hydrocarbon Contaminated Groundwater

These guidelines apply when a discharge meets any one of the criteria below<sup>1</sup>:

- A private or public water supply well actively used for human consumption of water is contaminated;
- A discharge is located in the source water protection area of a public water supply;
- A discharge is located within 1000' of an active community or non-community, non-transient water supply;
- A gasoline discharge is within 1000' of a private well or transient water supply in active use for human water consumption;
- A discharge of petroleum products other than gasoline is within 500' of a private well or transient water supply in active use for human water consumption;
- A discharge is located on a significant sand and gravel aquifer;
- A discharge is located where there is a high probability of future residential development and use of the groundwater for private drinking water wells.

## Tier 1 Statewide Ground Water & Drinking Water Remediation Guidelines for Petroleum Related Compounds (ug/L)<sup>1</sup>

CAS Number	Chemical	Guideline <sup>2</sup>
<b>Petroleum Target Compounds</b>		
91-57-6	2-Methylnaphthalene	<b>30</b>
83-32-9	Acenaphthene	<b>400</b>
208-96-8	Acenaphthylene	<b>400</b>
120-12-7	Anthracene	<b>2000</b>
71-43-2	Benzene	<b>4.0</b>

<sup>1</sup> MEG for acenaphthene used for acenaphthylene; MEG for pyrene used for benzo(g,h,i)perylene and phenanthrene; MEG for n-hexane used for C5-C8 aliphatics; MEG for C9-C17 aliphatic mixture used for C9-C12 aliphatics and C9-C18 aliphatics; MEG for C15-C45 aliphatics used for C18-C36 aliphatics; MEG for pyrene used for C9-C10 aromatics and C11-C22 aromatics..

<sup>2</sup> Guidelines are rounded to nearest single significant figure to be consistent with MCDC MEGs, except for MTBE which is established at 35ppb in Maine Department of Health and Human Services regulations.

56-55-3	Benzo(a)anthracene	0.5
50-32-8	Benzo(a)pyrene	0.05
205-99-2	Benzo(b)fluoranthene	0.5
191-24-2	Benzo(g,h,i)perylene	200
207-08-9	Benzo(k)fluoranthene	5.0
218-01-9	Chrysene	50
53-70-3	Dibenz(a,h)anthracene	0.05
100-41-4	Ethylbenzene	30
206-44-0	Fluoranthene	300
86-73-7	Fluorene	300
193-39-5	Indeno(1,2,3-cd)pyrene	0.5
7439-92-1	Lead	10
1634-04-4	Methyl tert-butyl ether	35
91-20-3	Naphthalene	10
85-01-8	Phenanthrene	200
129-00-0	Pyrene	200
108-88-3	Toluene	600
1330-20-7	Xylene	1000
<b>Petroleum Hydrocarbon Fractions</b>	C5-C8 Aliphatics	300
	C9-C12 Aliphatics	700
	C9-C18 Aliphatics	700
	C19-C36 Aliphatics	10,000
	C9-C10 Aromatics	200
	C11-C22 Aromatics	200

Guideline value may be lower than the Practical Quantification Limit (PQL) of the lab method. If so, use the PQL as the guideline for this contaminant.

1 Maine Guidelines include exceptions for discharges in areas where groundwater does not meet potability standards due to naturally occurring contaminants or historic land uses not related to the current discharge.

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# Maine Cleanup Standards for Hydrocarbon Contaminated Soil

Guidelines Based on Petroleum Leaching To Groundwater

## Tier 1 Soil Remediation Guidelines

Based on Petroleum Leaching to Ground Water<sup>1</sup>

Petroleum Target Compounds	Concentration (mg/kg) <sup>2</sup>
2-Methylnaphthalene	3.6
Acenaphthene	170
Acenaphthylene	68
Anthracene	2400
Benzene	0.51
Benzo(a)anthracene	10,000
Benzo(a)pyrene	10,000
Benzo(b)fluoranthene	10,000
Benzo(g,h,i)perylene	10,000
Benzo(k)fluoranthene	10,000

<sup>1</sup> Guidelines present the lower of soil concentrations derived for sand and gravel or sandy till soils using SESOIL leaching and AT123D dispersion/advection models, and Maine meteorological and geology data. The basis for the guidelines is presented in Appendix D.

<sup>2</sup> Shading indicates Department modeling predicted ground water exceedance of MEG unlikely in 1000 years regardless of soil concentration. Guideline therefore set at ceiling level of 10,000 mg/kg.

Chrysene	10,000
Dibenz(a,h)anthracene	10,000
Ethylbenzene	0.81
Fluoranthene	10,000
Fluorene	120
Indeno(1,2,3-cd)pyrene	10,000
Lead	10,000
Methyl tert-butyl ether	0.19
Naphthalene	1.7
Phenanthrene	97
Pyrene	10,000
Toluene	8.1
Xylene	26
<b>Petroleum Hydrocarbon Fractions</b>	
C5-C8 Aliphatics	1600
C9-C12 Aliphatics	10,000
C9-C18 Aliphatics	10,000
C19-C36 Aliphatics	10,000
C9-C10 Aromatics	75
C11-C22 Aromatics	460

1 Soil concentrations protective of groundwater potability are based on fate and transport modeling using SESOIL and AT-123D. Values in the table are the lower

of the results for transport in sand/gravel and till. For a complete discussion of the method and results, see “Remediation Guidelines for Petroleum Contaminated Sites in Maine.”

**Table 4**  
**Tier 1 Direct Contact Soil Remediation Guidelines for Smaller Petroleum Contamination Sites<sup>3</sup>**

<b>Chemical/Petroleum Fraction</b>	<b>Concentration (mg/kg)</b>
2-Methylnaphthalene	100
Acenaphthene	1,500
Acenaphthylene	1,500
Anthracene	760
Benzene	17
Benzo(a)anthracene	2.3
Benzo(a)pyrene	2.3
Benzo(b)fluoranthene	3.5
Benzo(g,h,i)perylene	750
Benzo(k)fluoranthene	2.6
Chrysene	26
Dibenz(a,h)anthracene	0.48
Ethylbenzene	130
Fluoranthene	1,000
Fluorene	1,000
Indeno(1,2,3-cd)pyrene	1.6
Lead	170
Methyl tert-butyl ether	790
Naphthalene	500
Phenanthrene	750
Pyrene	750
Toluene	2,700
Xylene	6,800
C5-C8 Aliphatics	1,400
C9-C12 Aliphatics	2,700
C9-C18 Aliphatics	2,700
C19-C36 Aliphatics	10,000
C9-C10- Aromatics	750
C11-C22 Aromatics	750

Value is greater than ceiling value of 10,000 mg/kg. The ceiling value is used as the guideline for this compound or fraction.

<sup>3</sup> These guidelines are the lowest of those presented in Table 5 for each compound, and represents the most conservative value for each of the common human exposure scenarios addressed in these guidelines.

Value may be less than the lab method's Practical Quantification Limit (PQL). If so, use the PQL as the guideline for this compound.

Tier 2 – Soil Guidelines for Common Exposure Scenarios

**TABLE 5**

**Tier 2 Soil Remediation Guidelines for Petroleum Target Compounds and Hydrocarbon Fractions (mg/kg)<sup>4</sup>**

Chemical/Fraction	Resident	Park User	OutdoorCommercialWorker	ExcvtNConstructnWrkr
2-Methylnaphthalene	100	170	730	120
Acenaphthene	1,500	2,500	10,000	2,000
Acenaphthylene	1,500	2,500	10,000	10,000
Anthracene	7,000	10,000	10,000	760
Benzene	17	28	86	30
Benzo(a)anthracene	Table 6	Table 6	Table 6	43
Benzo(a)pyrene	Table 6	Table 6	Table 6	Table 6
Benzo(b)fluoranthene	Table 6	Table 6	Table 6	43
Benzo(g,h,i)perylene	750	1,200	5,500	10,000
Benzo(k)fluoranthene	Table 6	4.4	35	430
Chrysene	26	44	350	4,300
Dibenz(a,h)anthracene	Table 6	Table 6	Table 6	4.3
Ethylbenzene	130	220	430	3,900
Fluoranthene	1,000	1,700	7,300	10,000
Fluorene	1,000	1,700	7,300	10,000

<sup>4</sup> Guidelines are based either on the health risk of cumulative exposures, the ceiling concentration where the health risk based value is greater than 10,000 mg/kg, or in the case of some PAHs on background concentrations in Maine. Cumulative risk-based guidelines consider combined exposure by ingestion, dermal contact, and inhalation of outdoor dust and vapors. The technical basis for these guidelines is provided in Appendix C.

Indeno(1,2,3-cd)pyrene	Table 6	Table 6	3.5	43
Lead	170	280	560	950
Methyl tert-butyl ether	790	1,300	2,600	10,000
Naphthalene	500	830	3,700	10,000
Phenanthrene	750	1,200	5,400	1,800
Pyrene	750	1,200	5,500	10,000
Toluene	2,700	4,500	10,000	10,000
Xylene <sup>(b)</sup>	6,800	10,000	10,000	10,000
C5-C8 Aliphatics	1,400	2,300	10,000	10,000
C9-C12 Aliphatics	2,700	4,400	10,000	10,000
C9-C18 Aliphatics	2,700	4,400	10,000	10,000
C19-C36 Aliphatics	10,000	10,000	10,000	10,000
C9-C10 Aromatics	750	1,200	5,500	10,000
C11-C22 Aromatics	750	1,200	5,500	10,000

Value is greater than ceiling value of 10,000 mg/kg. The ceiling value is used as the cumulative risk-based guideline for this compound.



Table 6

Tier 2 Soil Remediation Guidelines for Select Target Polycyclic Aromatics (PAHs) and Exposure Scenarios Where Background Concentrations Exceed Health Risk Based Concentrations (mg/kg)<sup>5</sup>

PAH	Residential		Park User		Outdoor Commercial Worker		Excavation/ Construction Worker	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Benzo(a)anthracene	4.2	2.3	4.2	2.3	4.2	Table5	Table5	Table5
Benzo(a)pyrene	4.6	2.3	4.6	2.3	4.6	2.3	4.6	2.3
Benzo(b)fluoranthene	5.3	3.5	5.3	3.5	5.3	Table5	Table5	Table5
Benzo(k)fluoranthene	3.2	2.6	Table5	Table5	Table 5	Table5	Table 5	Table5
Dibenz(a,h)anthracene	0.58	0.48	0.58	0.48	0.58	0.48	Table5	Table5
Indeno(1,2,3-cd)pyrene	2.6	1.6	2.6	1.6	Table5	Table5	Table5	Table5

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<sup>5</sup> Unless stated otherwise, guidelines based on 90<sup>th</sup> percentile of background PAH concentrations from Summary Report for Evaluation of Concentrations of Polycyclic Aromatic Hydrocarbons (PAHs) in Background Soils in Maine by AMEC for the Department of Environmental Protection, October 14, 2011. Locations within a designated Maine Dept. of Transportation Urban Compact Zone are defined as “Urban” for the purpose of using this table, all other locations are “Rural”.