Montana Cleanup Standards for Hydrocarbon Contaminated Groundwater

Tier 1 Groundwater RBSLs and Standards

This table applies to groundwater and consists of DEQ-7 Human Health Standards (HHSs), where available. For compounds without DEQ-7 HHSs, DEQ has developed RBSLs and included them in the table. For EPH compounds, a total extractable hydrocarbon (TEH) concentration of 1,000 µg/L is used to determine if additional analysis (fractionation) is needed. Surface water impacts require a minimum of a Tier 2 evaluation.

Chemical	Effect	Basis	Groundwater Standard or RBSL (µg/l)
For Gasoline and Light Hydrocarbons measured using the Massachusetts Method for Volatile Petroleum Hydrocarbons (VPH)			
TPH ceiling for gasoline and light hydrocarbons			1,000
C5-C8 Aliphatics	n	rb	700
C9-C12 Aliphatics	n	rb	1,000
C9-C10 Aromatics	n	rb	1,000
MTBE	n	hhs	30
Benzene	c	hhs	5
Toluene	n	hhs	1,000
Ethylbenzene	n	hhs	700
Xylenes	n	hhs	10,000
Naphthalene	n	hhs	100
Lead Scavengers			
Ethylene dibromide (EDB)	c	hhs	0.004
1,2, Dichloroethane (DCA)	c	hhs	4
For Diesel and Heavy Hydrocarbons measured using the Massachusetts Method for Extractable Petroleum Hydrocarbons (EPH)			
EPH / TEH Screen fractionation required			1,000
TEH ceiling for diesel and heavy hydrocarbons			1,000
C9-C18 Aliphatics	n	rb	1,000
C19-C36 Aliphatics	n	bu	1,000
C11-C22 Aromatics	n	rb	1,000
Acenaphthene	n	hhs	670
Anthracene	n	hhs	2,100
Benz(a)anthracene	c	hhs	0.5
Benzo(a)pyrene	c	hhs	0.05*
Benzo(b)fluoranthene	c	hhs	0.5
Benzo(k)fluoranthene	c	hhs	5
Chrysene	c	hhs	50
Dibenzo(a,h)anthracene	c	hhs	0.05*
Fluoranthene	n	hhs	130
Fluorene	n	hhs	1,100
Indeno(1,2,3-cd)pyrene	c	hhs	0.5
Naphthalene	n	hhs	100
Pyrene	n	hhs	830

Notes:

Effect is either: n = non-carcinogenic and direct contact RBSLs are based on a hazard quotient of 1, or c = carcinogenic and direct contact RBSLs are based on a cancer risk 1X10-5.

Basis is: rb=risk-based screening level; hhs=DEQ-7 Human Health Standard; or bu= adversely affects beneficial uses (foul taste or ordor)

DEQ's RBCA policy includes a ceiling concentration of 1,000 µg/l total purgeable hydrocarbons (TPH) for the Gasoline and Light Hydrocarbons and 1,000 µg/l total extractable petroleum hydrocarbons (TEH) for Diesel and Heavy Hydrocarbons.

The RBSLs for soil and water are not designed to be protective of the vapor intrusion (VI) pathway. Please refer to the Vapor Intrusion to Indoor Air Section of the Montana Tier 1 Risk-Based Corrective Action Guidance for Petroleum Releases.

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Montana Cleanup Standards for Hydrocarbon Contaminated Soils (Surface and Subsurface)

Tier 1 Surface Soils (0-2ft) RBSLs (mg/kg)

Distance to groundwater		< 10 feet to ground water		10-20 feet to ground water		> 20 feet to ground water	
Chemical units (mg/kg = ppm)	**E**	**>2 ft Excavation RBSL (mg/kg)**	**B**	**>2 ft Excavation RBSL (mg/kg)**	**B**	**>2 ft Excavation RBSL (mg/kg)**	**B**
For Gasoline and Light Hydrocarbons measured using the Massachusetts Method for Volatile Petroleum Hydrocarbons (VPH)							
C5-C8 Aliphatics	n	200	l	500	dc	500	dc
C9-C12 Aliphatics	n	1,000	dc	1,000	dc	1,000	dc
C9-C10 Aromatics	n	100	l	500	l	700	l
MTBE	c	0.08*	l	0.2	l	0.3	l
Benzene	c	0.04**	l	0.1	l	0.2	l
Toluene	n	10	l	40	l	60	l
Ethylbenzene	c	10	l	40	l	60	l
Xylenes	n	200	l	600	dc	600	dc
Naphthalene	n	9	l	30	l	50	l
Lead Scavengers							
1,2-Dibromoethane (EDB)	c	0.00002	l	0.00004	l	0.0001	l
1,2-Dichloroethane (DCA)	c	0.01	l	0.03	l	0.04	l
For Diesel and Heavy Hydrocarbons measured using the Massachusetts Method for Extractable Petroleum Hydrocarbons (EPH)							
EPH Screen, Fractionate		200		200		200	
C9-C18 Aliphatics	n	2,000	dc	2,000	dc	2,000	dc
C19-C36 Aliphatics	n	100,000	dc	100,000	dc	100,000	dc
C11-C22 Aromatics	n	400	l	1,000	l	2,000	l
Acenaphthene	n	200	l	800	l	1,000	l
Anthracene	n	4,000	l	10,000	l	20,000	dc

Benz(a)anthracene	c	10	l	50	l	50	dc
Benzo(a)pyrene	c	4	l	5	dc	5	dc
Benzo(b)fluoranthene	c	50	l	50	dc	50	dc
Benzo(k)fluoranthene	c	500	l	500	dc	500	dc
Chrysene	c	2,000	l	5,000	l	5,000	dc
Dibenzo(a,h)anthracene	c	5	dc	5	dc	5	dc
Fluoranthene	n	500	l	2,000	l	2,000	dc
Fluorene	n	600	l	2,000	l	2,000	dc
Indeno(1,2,3-cd)pyrene	c	50	dc	50	dc	50	dc
Naphthalene	n	9	l	30	l	50	l
Pyrene	n	2,000	dc	2,000	dc	2,000	dc

This table applies to contaminated subsurface soil (>2 feet below the ground surface). Distance to water is from the sample depth to the water table. **For VPH compounds at UST sites, default RBSLs, provided in bold on Table 1, are used to determine if a release has occurred at a site. Default RBSLs apply to the entire soil column and always apply in the absence of adequate information. For EPH compounds the 200 ppm screen concentration is used to determine if additional analysis (fractionation) of the soil sample is needed.**

Notes:

E = Effect is either: n = non-carcinogenic and direct contact RBSLs are based on a hazard quotient of 0.125 for a total hazard index which does not exceed 1, or C= carcinogenic and direct contact RBSLs are based on a cancer risk of 1X10-6 for a total cancer risk which does not exceed 1X10-5.

B = Basis is the most conservative of: l = leaching from soil to groundwater; dc = residential direct contact including ingestion, inhalation, and dermal; or bu = adversely affects beneficial uses (foul odor or taste)

If the leaching pathway is not the most conservative basis, excavation RBSLs apply to subsurface soil.

* = The best achievable practical quantitation limit (0.20) is greater than the RBSL; therefore, if the compound is detected, additional evaluation may be necessary.

** = The best achievable practical quantitation limit (0.05) is greater than the RBSL; therefore, if the compound is detected, additional evaluation may be necessary.

Tier 1 Subsurface Soils (>2 ft) RBSLs (mg/kg)

Distance to groundwater		**< 10 feet to groundwater**				**10-20 feet to groundwater**				**> 20 feet to groundwater**			
Chemical **units (mg/kg = ppm)**	**E**	**Residential RBSL (mg/kg)**	**B**	**Commercial RBSL (mg/kg)**	**B**	**Residential RBSL (mg/kg)**	**B**	**Commercial RBSL (mg/kg)**	**B**	**Residential RBSL (mg/kg)**	**B**	**Commercial RBSL (mg/kg)**	**B**
For Gasoline and Light Hydrocarbons measured using the Massachusetts Method for Volatile Petroleum Hydrocarbons (VPH)													
C5-C8 Aliphatics	n	**60**	dc	200	l	60	dc	300	dc	60	dc	300	dc
C9-C12 Aliphatics	n	**100**	dc	700	dc	100	dc	700	dc	100	dc	700	dc
C9-C10 Aromatics	n	**100**	dc	100	l	100	dc	500	l	100	dc	700	l
MTBE	c	**0.08***	l	0.08*	l	0.2	l	0.2	l	0.3	l	0.3	l
Benzene	c	**0.04****	l	0.04**	l	0.1	l	0.1	l	0.2	l	0.2	l
Toluene	n	**10**	l	10	l	40	l	40	l	60	l	60	l
Ethylbenzene	c	**6**	dc	10	l	6	dc	30	dc	6	dc	30	dc
Xylenes	n	**70**	dc	200	l	70	dc	300	dc	70	dc	300	dc
Naphthalene	c	**4**	dc	9	l	4	dc	20	dc	4	dc	20	dc
Lead Scavengers													
1,2-Dibromoethane (EDB)	c	0.00002	l	0.00002	l	0.00004	l	0.00004	l	0.0001	l	0.0001	l
1,2-Dichloroethane (DCA)	c	0.01	l	0.01	l	0.03	l	0.03	l	0.04	l	0.04	l
For Diesel and Heavy Hydrocarbons measured using the Massachusetts Method for Extractable Petroleum Hydrocarbons (EPH)													
EPH Screen, Fractionate		200		200		200		200		200		200	
C9-C18 Aliphatics	n	200	dc	1,000	dc	200	dc	1,000	dc	200	dc	1,000	dc
C19-C36 Aliphatics	n	20,000	dc	100,000	dc	20,000	dc	100,000	dc	20,000	dc	100,000	dc
C11-C22 Aromatics	n	400	1	400	l	500	dc	1,000	l	500	dc	2,000	l
Acenaphthene	n	200	l	200	l	400	dc	800	l	400	dc	1,000	l

Anthracene	n	2,000	dc	4,000	l	2,000	dc	10,000	l	2,000	dc	20,000	dc
Benz(a)anthracene	c	0.2	dc	2	dc	0.2	dc	2	dc	0.2	dc	2	dc
Benzo(a)pyrene	c	0.02***	dc	0.2	dc	0.02***	dc	0.2	dc	0.02***	dc	0.2	dc
Benzo(b)fluoranthene	c	0.2	dc	2	dc	0.2	dc	2	dc	0.2	dc	2	dc
Benzo(k)fluoranthene	c	2	dc	20	dc	2	dc	20	dc	2	dc	20	dc
Chrysene	c	20	dc	200	dc	20	dc	200	dc	20	dc	200	dc
Dibenzo(a,h)anthracene	c	0.02***	dc	0.2	dc	0.02***	dc	0.2	dc	0.02***	dc	0.2	dc
Fluoranthene	n	300	dc	500	l	300	dc	2,000	l	300	dc	2,000	dc
Fluorene	n	300	dc	600	l	300	dc	2,000	l	300	dc	2,000	dc
Indeno(1,2,3-cd)pyrene	c	0.2	dc	2	dc	0.2	dc	2	dc	0.2	dc	2	dc
Naphthalene	n	4	dc	9	l	4	dc	20	dc	4	dc	20	dc
Pyrene	n	200	dc	2,000	dc	200	dc	2,000	dc	200	dc	2,000	dc

Notes:

E = Effect is either: n = non-carcinogenic and direct contact RBSLs are based on a hazard quotient of 0.125 for a total hazard index which does not exceed 1, or C= carcinogenic and direct contact RBSLs are based on a cancer risk of 1X10-6 for a total cancer risk which does not exceed 1X10-5.

B = Basis is the most conservative of: l = leaching from soil to groundwater; dc = residential direct contact including ingestion, inhalation, and dermal; or bu = adversely affects beneficial uses (foul odor or taste)

If the leaching pathway is not the most conservative basis, excavation RBSLs apply to subsurface soil.

* = The best achievable practical quantitation limit (0.20) is greater than the RBSL; therefore, if the compound is detected, additional evaluation may be necessary.

** = The best achievable practical quantitation limit (0.05) is greater than the RBSL; therefore, if the compound is detected, additional evaluation may be necessary

*** = The best achievable practical quantitation limit (0.33) is greater than the RBSL; therefore, if the compound is detected, additional evaluation may be necessary.

This table applies to contaminated surface soil from 0-2 feet below ground surface. Distance to water is from the sample depth to the water table. **For VPH compounds at UST sites, default RBSLs (bold) are used to determine if a release has occurred at a site. Default RBSLs apply to the entire soil column**

and always apply in the absence of adequate information. For EPH compounds, the 200 ppm EPH screen concentration is used to determine if additional analysis (fractionation) is needed.

For information regarding odor considerations, please refer to the Odors as a Significant Risk to Public Welfare/Nuisance Condition Section of the Montana Tier 1 Risk-Based Corrective Action Guidance for Petroleum Releases. The RBSLs for soil and water are not designed to be protective of the vapor intrusion (VI) pathway. Please refer to the Vapor Intrusion to Indoor Air Section of the Montana Tier 1 Risk-Based Corrective Action Guidance for http://www.deq.mt.gov/default.mcpx Petroleum Releases.

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