APPENDIX D

Risk Based Screening Levels and Standards

Groundwater and Surface Water Guidance

Screening Groundwater and Surface Water Data:
The Montana Risk-Based Corrective Action Guidance for Petroleum Releases Guidance uses several sources for comparing contaminate levels to either standards or screening levels, these are described in more detail below.

Contaminant concentrations in ground water are compared to Circular DEQ-7 Montana Numeric Water Quality Standards (DEQ-7 Standards) human health standards for groundwater, where available. For compounds that do not have a DEQ-7 Standard, a Risk-based screening level was calculated or an EPA-derived regional screening level for tap water was used (see Table 3).

Concentrations in surface water are compared to DEQ-7 surface water standards (depending on the water body classification, the more conservative of either the human health and aquatic life standards), where available, or other available screening levels (examples are Montana-derived Risk-Based Screening Levels, EPA derived Regional Screening Levels for tap water, and EPA "BTAG" freshwater screening levels for ecological receptors).

Groundwater Standards (DEQ-7):
Montana's water quality standards can be found in Montana Code Annotated (MCA) 75-5 part 3, Classification and Standards and in ARM, 17.30.620 through 17.30.670 (surface water), and ARM 17.30.1001 through 17.30.1045 (ground water) (2019 Circular DEQ-7, Montana Numeric Water Quality Standards).

As required by law, Montana's water quality standards must be met depending on the beneficial uses of the ground or surface water (ARM 17.30.1006 and ARM 17.30.6006-17.30.617 for GW and SW, respectively). ARM 17.30.1006 Classifications, Beneficial Uses, and Specific Standards for Groundwaters describes GW classifications and what uses need to be protected. Unless the natural specific conductance of the water is greater than 15,000 micro-Siemens/cm at 25°C (Class IV GW), all human health standards/risk-based screening levels must be met. Even if the natural specific conductance of the water is greater than 15,000 micro-Siemens/cm at 25°C (Class IV GW), the groundwater must meet DEQ-7 Standards for carcinogens (like benzene).

The DEQ-7 groundwater standards are based on EPA Drinking Water MCLs, Health Advisories, National Recommended Water Quality Criteria, or toxicology data from the integrated risk information system, several other toxicology sources are also used where information is not available from the above listed sources. DEQ-7 risk-based standards are developed with the assumption that an 80 kg person will consume 2.4 liters a day for 70 years. Note: DEQ-7 standards apply to groundwater based on the groundwater classification and are not tied to the use (or lack thereof) of groundwater as a drinking water source at a specific release or site.

DEQ-7, Narrative Standards, Risk-Based Screening Levels and EPA RSLs :
Montana's surface water and ground water rules contain narrative standards (ARM 17.30.620 through 17.30.670 and ARM 17.30.1001 through 17.30.1045). The narrative standards cover several parameters, such as alkalinity, chloride, hardness, sediment, sulfate, and total dissolved solids for which sufficient information does not yet exist to develop specific numeric standards. These narrative standards are directly translated to protect beneficial uses from adverse effects, supplementing the existing numeric standards (DEQ-7).

The petroleum fractions do not have DEQ-7 Standards. DEQ has calculated risk-based screening

levels (RBSLs) for the petroleum fractions using toxicity values as outlined in Table B1 of Appendix B and Tables D1 and D2, below.

The EPA residential exposure scenarios were used for the averaging time (9490 days (365 days x 26 years); exposure duration (26 years based on the 2011 exposure factor's handbook); exposure frequency (350 days/year); water intake (IRw, 2.5 liters); volatilization factor (VF, 0.5); and residential exposure time (ETres of 1).

DEQ's petroleum fraction screening procedure is based on the use of the Massachusetts method for volatile petroleum hydrocarbons and extractable petroleum hydrocarbons to help characterize risks posed by petroleum releases. Therefore, for the fraction toxicity data, RfDo, RfC and RAFw, DEQ used the Massachusetts toxicity values (MADEP, 2002), with the exception of one fraction range, aliphatic C19-C36 for which PPRTV 2022 was used instead (please note the value for this fraction range did not change from 2009 with the 2022 PPRTV update). Because MADEP used the previous IRIS RfC value for n-hexane (EPA, 1993) in its C5-C8 aliphatic calculation and the IRIS values for n-hexane were updated, the updated IRIS (EPA, 2005) RfC was used instead of the previous IRIS RfC.

Regardless of if screening levels are exceeded or not, if there are visible signs of contamination (sheen/globules, etc., or odor or taste concerns), the site cannot be closed until these issues are resolved.

For the DEQ RBSL calculations, the EPA RSL equation for tap water screening levels was used as shown below:

RBSL (tap water µg/L) = (THQ*AT*CF*BW)/(ED*EF*((RAFw*IRw/RfDo) +(VF*ETres/RfC)))

Parameters	2023 updates
THQ (Target hazard quotient- unitless)	1
BWa (adult body weight - kg; EPA, May 2023)	80
AT (Averaging time - day; EPA, May 2023)	9490
CF (Conversion factor - µg/mg)	1000
ED (Exposure duration - yr; EPA, May 2023)	26
EF (Exposure frequency - day/yr; EPA, May 2023)	350
RAFw (Chemical specific water relative absorption factor – (MADEP, 2003)	
IRw (Ingestion rate - L/day; (EPA, May 2023)	2.5
RfDo (Chemical specific oral reference dose - mg/kg-day; MADEP, 2003 PPRTV, 2022))	
VF (Volatilization factor - L/m^3) (EPA, May 2023)	0.5
ETres (Residential exposure time - 24 hr./day*1 day/24 hr; EPA, May 2023)	1
RfC (Chemical specific inhalation reference concentration - mg/m^3 (MADEP, 2003 and PPRTV, 2022)	

Table D1 parameters and references for RBSL calculations. The green rows are chemical specific and can be found in Table D2.

Chemical	RFDo	RfC	RAFw

C5-C8 Aliphatics	0.04	0.7 (IRIS, 2005)	1
C9-C12 Aliphatics	0.1	0.2	1
C9-C10 Aromatics	0.03	0.05	0.91
C9-C18 Aliphatics	0.1	0.2	1
C19-C36 Aliphatics	3 (PPRTV, 2022)	X	1
C11-C22 Aromatics	0.03	.05	0.91

Table D2. Chemical specific values for fractions
X= value not included in the calculation

For Contaminants not included in Table 3:
There may be times when contaminants detected in water samples are not listed in Table 3. These contaminants may include metals, chlorinated compounds, pesticides, nitrate, and salts. If there are contaminants in the groundwater or surface water that are not listed in Table 3, these should be screened first using DEQ-7 Standards; and if there is no DEQ-7 Standard for a chemical, then it should be screened using the EPA RSLs for tap water. If you have questions, be sure to consult with your DEQ contact.

Surface Water:
Circular DEQ-7 contains surface water standards (based on protection of both human health and aquatic life) that are to be used when evaluating petroleum concentrations in surface water. DEQ-7 groundwater standards should not be compared to surface water results. DEQ-7 surface water standards can be found in the Montana Department of Environmental Quality's DEQ-7 Circular. Where DEQ-7 standards are not available, RBSLs or RSLs may be used for screening, with DEQ approval. For example, the ground water petroleum fraction RBSLs and tap water EPA RSLs may be used as screening levels in surface water for the protection of human health.

Sample methodology:
It is the responsibility of the owner/operator to ensure the appropriate methods and reporting limits are requested from the laboratory to meet analytical and reporting limit needs. If the data is not of sufficient quality, DEQ may reject the results and request the samples to be resubmitted.

References

Massachusetts Department of Environmental Protection (MADEP). 2002. Characterizing Risks Posed by Petroleum Contaminated Sites: Implementation of MADEP VPH/EPH Approach, Final Policy, October 2002. Bureau of Waste Site Cleanup, Boston, MA.

Montana DEQ. 2019. Montana Circular DEQ-7. June 2019. Montana Department of Environmental Quality, Helena, MT.

United States Environmental Protection Agency. EPA. 2022. Provisional Peer-Reviewed Toxicity Values for Complex Mixtures of Aliphatic and Aromatic Hydrocarbons, September 2009. Superfund Health Risk Technical Support Center, National Center for Environmental Assessment. Office of Research and Development, U.S. Environmental Protection Agency.

EPA (United Stated Environmental Protection Agency), 1993. Integrated Risk Information System (IRIS) Chemical Assessment Summary for n-Hexane.

EPA, 2005. Integrated Risk Information System (IRIS) Chemical Assessment Summary for n-Hexane. December.

U.S. Environmental Protection Agency (EPA). 2023. Regional Screening Levels (RSLs), November, 2023. .