

VI APH Calculator Discussion

The Air-Phase Petroleum Hydrocarbon Vapor Intrusion (APH VI) Screening Level Calculator is designed as a simple screening tool to determine if vapor intrusion exceeds generic risk-based screening levels at sites with **ONLY petroleum contamination**. This calculator is not meant to be used with solvent sites or mixed waste sites containing a combination of petroleum and other sources.

To use this calculator simply compare the analytical results to Table 1's DEQ/EPA RSL Screening levels. Add those compounds that exceed Table 1's screening levels to Table 2 by clicking one-by-one on the drop-down tabs (this includes any compounds that were J-flagged). As compounds are entered, the calculator will display the adjusted residential and industrial screening levels.

This calculator uses the general assumptions for site-specific vapor intrusion risk assessment/analysis discussed on DEQ's FAQs website: <http://deq.mt.gov/StateSuperfund/FrequentlyAskedQuestions.mcp#5>

DEQ will not accept a cumulative cancer risk for carcinogenic compounds exceeding 1×10^{-5} and a total hazard index (HI) for non-carcinogenic compounds exceeding 1 for each target organ.

For carcinogenic compounds the calculator will adjust the 1×10^{-5} screening level by the number of carcinogenic compounds detected at your facility.

For non-carcinogenic compounds the HI = 1 screening level will be adjusted by the number of compounds affecting each target organ.

For benzene and naphthalene the carcinogenic screening level is several times lower than the noncarcinogenic screening level even when cumulative effects are considered. The carcinogenic screening level for benzene represents a hazard index of 0.04 and the carcinogenic screening level for naphthalene represents a hazard index of 0.09. Therefore the carcinogenic screening levels for these compounds represent a negligible noncarcinogenic risk. These carcinogenic screening levels are protective even if other compounds with the same critical effects (C5-C8 aliphatics, and C9-C12 aliphatics) are adjusted to account for a greater proportion of the allowable hazard index.

The petroleum fractions were calculated by DEQ and are based on toxicological information from the EPA Provisional Peer-Reviewed Toxicity Values for Complex Mixtures of Aliphatic and Aromatic Hydrocarbons (CASRN Various), 2009. The remaining petroleum compounds were derived from the April 2012 RSL table and adjusted to account for a 78-year life expectancy from the 2011 EPA Exposure Factors Handbook.

The table below shows the various APH compounds and their associated critical effects.

Compounds	Critical Effects or Effected Target Organs
Benzene*, 1,3-Butadiene*, 1,2-Dichloroethane (DCA)*, Ethylbenzene**, Ethylene Dibromide (EDB)*, MTBE**, Naphthalene**	Carcinogens
1,3-Butadiene*	Ovarian atrophy
Aromatic (C9-C10) ⁺	Maternal body weight reduction
MTBE*, 1,2-Dichloroethane ⁺⁺	Liver
MTBE*	Kidney
Benzene*	Decreased lymphocyte count
Aliphatic (C5-C8) ⁺ , Aliphatic (C9-C12) ⁺ , Ethylene Dibromide (EDB)*, Naphthalene*	Nasal effects
Aliphatic (C9-C12) ⁺	Adrenal hyperplasia
Toluene*	Neurological effects
Ethylbenzene*	Developmental effects
MTBE*	Swollen periocular tissue
MTBE*	Increased prostration
Xylenes* (mixture of m, p, and o-xylene)	Impaired motor coordination (decreased rotarod performance)

* EPA Integrated Risk Information System; ⁺ EPA Provisional Peer-Reviewed Toxicity Values for Complex Mixtures of Aliphatic and Aromatic Hydrocarbons (CASRN Various), 2009, **California EPA; ⁺⁺EPA Provisional Peer-Reviewed Toxicity Values for 1,2-Dichloroethane (CASRN 107-06-2)