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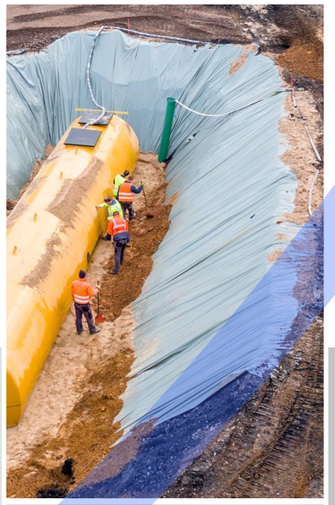
Lead Scavengers



The Lead Scavenger Experts

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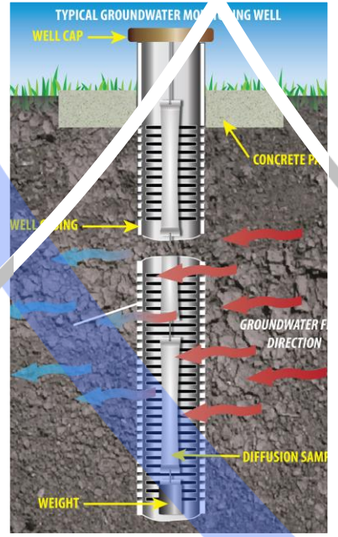
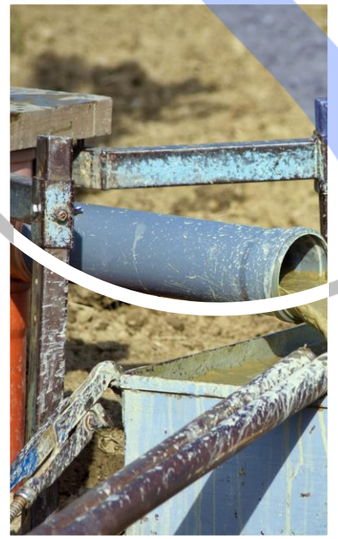




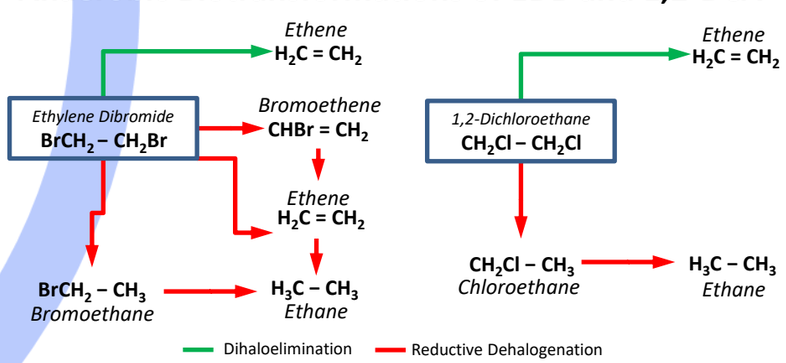
Lead Scavengers

Little attention has been paid to the threat the gasoline lead scavenger additives 1,2-dichloroethane (1,2-DCA) and ethylene dibromide (EDB) pose to groundwater. Lead scavengers were first added to automobile gasoline in the 1920s and finally removed from gasoline in 1988 when automobile leaded gasoline was phased out in the U.S. Lead scavengers have been released to the environment from the documented 135,000 underground storage tank (UST) gasoline releases that occurred prior to 1979. Investigation and remediation of these historic gasoline releases focused on benzene, toluene, ethyl benzene and xylene (BTEX) plumes and did not fully consider the possible extent and magnitude of groundwater contamination by lead scavengers. The continued use and storage of aviation leaded gasoline with the lead scavenger additive EDB, in UST systems, continues to represent a potential source of EDB in groundwater.

Leaded gasoline had widespread use and is still used today primarily as aviation gasoline. The storage of leaded gasoline in systems prone to leakage, and the fate and transport properties of the lead scavengers give rise to the possibility that lead scavengers can impact drinking water supplies. The investigation and clean up of leaking UST systems known to have contained leaded gasoline, employed analytical techniques with detection limits in excess of the MCL for EDB, and in most cases 1,2-DCA. Given the higher mobility of the lead scavengers and the lower MCLs, in comparison to the BTEX contaminants, it is possible that historic remedial efforts have failed to adequately address the full extent of lead scavenger impacted groundwater.

Field evidence suggests that groundwater impacts by lead scavengers are a reality. In a study conducted by the US EPA, regulated chemical analytical results for more than 20,000 drinking water systems were ranked in order of occurrence above respective MCL levels. The results of the study ranked EDB fourth highest, which is higher than 1,2-DCA and benzene, and similar to TCE and PCE.

Anaerobic Biotransformations of EDB and 1,2-DCA[1]



Sources:

1. 1. API (2008). The Environmental Behavior of Ethylene Dibromide and 1,2-Dichloroethane in Surface Water, Soil, and Groundwater. Publication 4774 (http://www.api.org/ehs/groundwater/upload/4774_e1.pdf)
2. 2. http://www.gsi-net.com/en/publications/gsi-chemical-database/list.html
3. 3. Wilson, J.T., et al. (2008). Natural Attenuation of the Lead Scavengers 1,2-Dibromoethane (EDB) and 1,2-Dichloroethane (1,2-DCA) at Motor Fuel Release Sites and Implications for Risk Management. EPA-600/R-08/107. September. (http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1002UTI.PDF)

Properties of Selected Gasoline Additives[2]

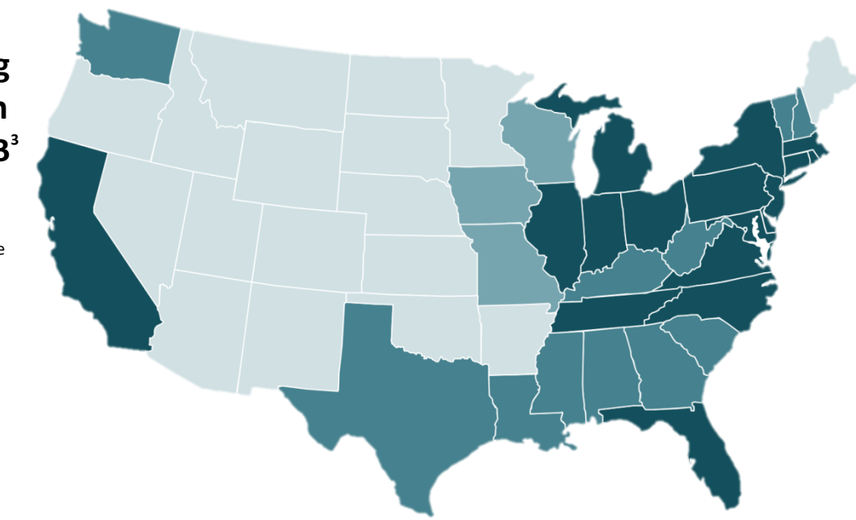
Compound	Volatility (mm Hg)	Sorption ($\log K_{oc}$) (unitless)	$\log K_{ow}$ (unitless)	Solubility (mg/L)	Henry's Constant (unitless)	Regulatory Levels	
						CA MCL (µg/L)	US MCL (µg/L)
1,2-DCA	81.3	1.24	1.83	8,700	0.053	0.5	5
EDB	11	1.73	2.01	4,320	0.029	0.05	0.05
MTBE	249	1.15	1.43	48,000	0.024	13/5*	20-40 (advisory)
Benzene	95	1.82	1.99	1,770	0.23	1	5

Notes: K_{ow} = octanol-water partition coefficient; K_{oc} = organic carbon partition coefficient; MCL = maximum contaminant level; * = secondary MCL

Key Points

- 1,2-DCA and EDB, among other uses, have a long and widespread historic use as additives in leaded gasoline. EDB is still added today to aviation gasoline.
- Lead scavengers are mobile and can be persistent in the environment. The full extent and magnitude of lead scavenger impacts to groundwater is not fully known.
- Historic operation and maintenance procedures for USTs were not as rigorous when leaded gasoline was used as they are today. The occurrence of leaks from these systems was not as well regulated, and likely to have been more commonplace.
- Historic UST investigation and remediation practices did not focus on the lead scavengers and analytical analyses for these contaminants were not routinely carried out. In cases where analytical testing suites included the lead scavengers, it is likely that the quantification limits were set higher than the respective MCLs.
- Appropriate investigations of EDB impacts require the use of EPA Method 8011 or EPA Method 504.1. Investigations of 1,2-DCA require the use of EPA Method 8021B, which provides quantification limits below the MCL.
- All contaminant releases pose risks and liabilities. These regulated contaminants have very low MCLs (compared to benzene, TCE, PCE etc.), indicating a high potential risk to human health. EDB concentrations of 0.01 µg/L detected in drinking water systems require a monitoring response by the operator. Detections of EDB above 0.05 µg/L require mitigation measures and or closure of the well.
- The detection of lead scavenger groundwater impacts may lead to the re-opening of UST cases with no further action (NFA) decisions.
- When entering into a real estate transaction concerning a former UST site, consideration should be given to potential lead scavenger groundwater impacts despite the existence of a NFA letter.

Relative Risk of Drinking Water Contamination in the United States by EDB[3]



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