

1.0 INTRODUCTION

1.1 Background

Ethylene dibromide (EDB) and ethylene dichloride (EDC; also known as 1,2-dichloroethane or 1,2-DCA) are synthetic organic chemicals used in leaded gasoline to prevent the buildup of lead deposits that foul internal combustion engines. In this capacity, EDB and EDC are referred to as “lead scavengers”. EDB has been used as a pesticide and fumigant. EDB is now used as a chemical intermediate in synthesis and as a nonflammable solvent for resins, gums, and waxes.

In addition to its use as a lead scavenger EDC was used as a fumigant, in varnish and finish removers, in soaps and scouring compounds, in organic synthesis for extraction and cleaning purposes, in metal degreasers, in ore floatation, and in paints, coatings and adhesives. EDC is now primarily used to manufacture vinyl chloride.

Even though leaded gasoline has not been used for on-road automobiles for more than a decade, leaded gasoline (which also contains lead scavengers) is still in use in aviation gasoline (avgas) and in some off-road applications such as racing fuel. Material Safety Data Sheets (MSDS) obtained for leaded automobile racing fuel do not indicate the composition (i.e., whether they contain EDB or EDC and at what concentrations) of the lead scavenger package that these fuels contain.

In 1989, EPA promulgated a maximum contaminant level (MCL) of 5 micrograms per liter ($\mu\text{g/L}$) for EDC in water. This MCL is based on EDC’s effects on the human central nervous system, lungs, and liver as well as on the cancer risk posed by the compound. The MCL for EDB, which was promulgated in 1992, is 0.05 $\mu\text{g/L}$ in water. This MCL is based on EDB’s effects on the human stomach, adrenal glands, reproductive system, respiratory system, nervous system, liver, heart, and kidneys as well as on the cancer risk posed by the compound.

Some recent work indicates that these compounds persist in some groundwater environments associated with leaking underground storage tanks (USTs) and may potentially affect drinking water systems. In summer 2004, Ronald Falta, a Professor at Clemson University in South Carolina, published “The Potential for Ground Water Contamination by the Gasoline Scavengers Ethylene Dibromide and 1,2-Dichloroethane” in *Ground Water Monitoring and Remediation* (Volume 24, Number 3, pages 76 through 87). In his paper, Dr. Falta discusses the history of leaded gasoline additives, reviews the occurrence of EDB and EDC in drinking water, discusses state regulations and analytical methods, addresses fate and transport, and reviews selected field evidence of EDB’s persistence and mobility. He concludes that, due to a general lack of attention given to lead scavengers at leaking underground storage tanks (LUST) sites, “[i]t would seem prudent to initiate a research program to establish the magnitude and extent of ground water contamination by these lead scavengers....”

1.2 Current Investigation

To determine whether these compounds pose a potential threat to human health or the environment, the U.S. Environmental Protection Agency’s (EPA) Office of Underground

Storage Tanks (OUST) teamed with the Association of State and Territorial Solid Waste Management Officials (ASTSWMO) to investigate the occurrence of lead scavengers in the environment. The investigation is proceeding in three phases:

- Phase 1: Define what is known about the potential magnitude of the problem
- Phase 2: Address gaps in knowledge identified in Phase 1
- Phase 3: Formulate an appropriate response

Information collected during Phase 1 has been assembled into this compendium, which represents the current state of knowledge of lead scavengers and their occurrence at LUST sites. The remaining sections of this compendium are:

- Historical Uses (Section 2)
- Physical and Chemical Properties and Analytical Methods (Section 3)
- Environmental Transport and Fate (Section 4)
- Toxicology (Section 5)
- Occurrence in Drinking Water (Section 6)
- Presence at LUST Sites (Section 7)
- Remediation and Treatment Technologies (Section 8)

1.3 Information Sources

EPA has examined readily available information from EPA Headquarters and the regions, various states, and the scientific literature to identify the properties and occurrence of EDB and EDC as well as remedial technologies for these compounds.

The following EPA Headquarters offices were contacted during the preparation of this report:

- Office of Water
- Office of Pesticide Programs
- National Center for Environmental Assessment
- National Exposure Research Laboratory
- Robert S. Kerr Environmental Research Center, Subsurface Protection and Remediation Division

Several states were found to have readily accessible data on EDB and EDC. Representatives of the Kansas Department of Health and Environment, the South Carolina Department of Health and Environmental Control, and Santa Barbara County in California were contacted to obtain additional information about the occurrence of EDB and EDC in their areas. Additional data for selected sites in EPA Region 8 and in South Carolina were also obtained.

To identify relevant scientific literature, EPA performed an online search of the National Ground Water Association database of journal articles as well as a search of selected Internet sites.