Investigation and Remediation

Evidence for Contamination of Heating Oil and Diesel Fuel with MTBE

by Gary A. Robbins and Brent J. Henebry

The widespread use of methyl tert-butyl ether (MTBE) at high concentrations in gasoline began in Connecticut and other areas of the United States in the early 1990s in response to requirements of the 1990 Clean Air Act Amendments. Relative to other gasoline contaminants of interest, MTBE has a higher affinity for groundwater and a lower potential for natural biodegradation and retardation. For this reason, MTBE has emerged as a common groundwater contaminant associated with gasoline releases and has become the focus of an ongoing national debate regarding its continued use.

To add to this debate, recent research conducted by the University of Connecticut Hydrogeology Program provides evidence for widespread contamination of heating oil and diesel fuel with MTBE. Inasmuch as MTBE is a fuel oxygenate that is blended with gasoline, its presence in heating oil and diesel fuel is troublesome. This article will summarize what we've found through our research and describe our ongoing investigation of this issue.

Evidence for MTBE in Diesel Fuel

Our story begins at the University of Connecticut Motor Pool, a gasoline fueling facility. Post-LUST-remediation groundwater monitoring in November 1997 and March 1998 revealed the presence of elevated levels of MTBE at the pump island. No BTEX or PNA constituents were present.

One hypothesis developed to explain these findings attributed the problem to spills of MTBE-contaminated diesel fuel. To investigate this hypothesis, four samples of diesel fuel were collected from the motor pool in March 1998 for analysis. The results of the analyses indicated the presence of MTBE in all four samples at levels ranging from 61 to 66 mg/L.

Equilibrium octanol water partition calculations revealed that if this diesel fuel were to come into contact with groundwater, an MTBE concentration of up to 6,000 µg/L could be achieved. This level of contamination was in the range of that observed in the groundwater at the motor pool site.

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A simple calculation was conducted to assess the amount of gasoline required to contaminate the diesel fuel to the concentrations detected. We determined that only 2.7 gallons of gasoline containing 15 percent MTBE by volume would be needed to contaminate a 5,000-gallon diesel tank to these levels.

Evidence for MTBE in Heating Oil

The motor pool diesel fuel findings were reported to the Connecticut Department of Environmental Protection's (CTDEP's) LUST Trust Program. Upon a preliminary file review, the department determined that MTBE groundwater contamination was often found in association with heating oil releases. In December 1998, we carefully reviewed a total of 78 case files to determine the frequency and magnitude of MTBE detection at heating oil release sites.

We looked for sites that met the following criteria:

- The site had been affected by a heating oil release and had no nearby source of gasoline contamination (e.g., gasoline station, automotive repair shop);
- Groundwater analysis for MTBE had been conducted; and
- Petroleum product groundwater contamination had been detected through analysis of near-field groundwater.

A total of 37 sites met these criteria and were used as a population for a statistical evaluation.

MTBE was detected in groundwater at 27 (73 percent) of the 37 sites. The maximum reported MTBE concentrations ranged from 1 to 4,100 µg/L. With respect to regulatory limits, 19 percent of the sites had MTBE groundwater contamination levels that exceeded the CTDEP groundwater protection criteria of 100 µg/L.

With respect to the U.S. EPA Drinking Water Advisory, 32 percent of the sites exceeded the upper limit of 40 µg/L and 46 percent of the sites exceeded the lower limit of 20 µg/L. For a detailed description of this research, refer to "Evidence for MTBE in Heating Oil" in the Spring 1999 issue of *Groundwater Monitoring and Review*.

Consequences

The source of the MTBE contamination of diesel fuel and heating oil is currently not known. Contamination could result from the use of similar lines or vehicles during transportation from the refinery to end users. The presence of MTBE in fuel oil and diesel fuel is troubling, not only because it indicates that potential sources of MTBE contamination are widespread, but also because it could well result in increased remediation costs for heating oil and diesel fuel releases and increased litigation between home owners, insurance companies, and oil companies.

Current Research

Additional research is under way to determine the source and magnitude

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of the MTBE contamination. We are currently testing an analytical method that can detect MTBE in product at low levels (ppb range) for reproducibility and accuracy. The method being tested is a static headspace procedure using gas chromatography. Quantification is made using a standard addition procedure.

Once the method has been verified, we will collect product at various key points in the fuel transfer chain to determine the source and magnitude of the contamination. Also, diesel fuel and heating oil will be collected from several locations at four different times during the year to determine the extent of seasonal variations of contamination levels. ■

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