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R00-19(B)
P.C. #4

EZK

Amy L. Jackson
Hearing Officer
Illinois Pollution Control Board
600 South Second Street
Springfield, Illinois 62704

Dear Ms. Jackson:

Please accept the following data to add to the comment docket on R00-19, the proposed amendments to tiered approach to corrective action objectives (35 Ill. Adm. Code 742). As you recall, I presented oral testimony at the September 11, 2000 IPCB hearing on R00-19. One of the petroleum industry's major concerns regarding the proposed changes to Section 342 was its development of a biodegradation rate for MTBE (methyl tertiary butyl ether).

During the hearing we were encouraged to present the board with any additional information on degradation rates. I am enclosing citations for several technical studies that could assist the board in establishing an effective degradation standard.

Thanks in advance for your consideration on this matter. We look forward to continued dialogue on R00-19 rulemaking. Please feel free to contact me if you have any questions regarding this material.

Sincerely,

David A. Sykuta

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In response to the Illinois Environmental Protection Agency's (IEPA) proposal to amend Part 742 of Illinois Administrative Code 35 as it relates to an MTBE identifiable contaminant level and biodegradation rate, the Illinois Petroleum Council (IPC) supports the following: The IPC supports the proposed 70ppb as the MTBE identifiable contaminant level in groundwater. The IPC also supports a default MTBE degradation rate of "zero", but requests language in the rule to allow the use of a site specific degradation rate where appropriate.

Introduction

During the IEPA's testimony before the Illinois Pollution Control Board (IPCB) at the August 25th, 2000, public hearing on MTBE issues, they proposed an identifiable contaminant level of 70 ppb for groundwater. As stated in their testimony, the number was derived as a direct result of the agency and industry working together. Specifically, BP Amoco, Equiva, Marathon and ExxonMobil completed a voluntary study looking at more than 80 current remediation projects to determine the extent of MTBE impact in groundwater. This information was given to the IEPA to review and provided support for a 70 ppb identifiable contaminant level for groundwater. Thus, the IPC supports this value.

In regards to a specific MTBE biodegradation rate, the IEPA declined to propose a degradation rate stating that they did not have sufficient technical data. As a result they proposed that the IPCB review MTBE technical data and establish an appropriate biodegradation rate. The IEPA suggested that based on available technical data, "zero" might be the most appropriate degradation rate for MTBE.

As we stated in our September 11, 2000, testimony before the IPCB, our industry would review the available technical data and recommend to the IPCB a MTBE degradation rate for the final rule. The following discussion is a review of several recent MTBE biodegradation studies that the IPC feels support language in the final rule that allows for site-specific MTBE biodegradation rates.

MTBE Biodegradation Studies

Prior to the mid-1990's, there were only a few studies completed on the biodegradability of MTBE in groundwater. The findings from these early studies suggested that MTBE is not readily biodegradable in the subsurface environment. More recent studies however have shown that MTBE does biodegrade.

Since 1997, five noteworthy studies have shown MTBE biodegradation. These studies indicate that as more testing is done of MTBE, more evidence is being collected that justifies its biodegradability via naturally-occurring microorganisms. It has also been shown that technologies used to cleanup BTEX can be used in some cases to effectively clean-up MTBE in soil and groundwater.

Although often done with BTEX constituents, it is hard to assign a conservative first-order degradation rate constant for MTBE, which can be universally applied to groundwater models. While BTEX biodegradation in aquifers is ubiquitous, significant MTBE biodegradation activity (i.e., biodegradation rate that will affect the size of the plume) may or may not be present at a given site. The following is a summary of five studies that have documented MTBE biodegradation rates:

1) Robert Borden et al. completed a study at a petroleum-release site in Sampson County, NC, which found in-situ MTBE biodegradation rates ranging from 0 to 0.0010/d (1/2 life of approx. 2 years), depending on where the measurement was made.

2) Relative to the source zone, Mario Shirmer did a natural gradient tracer test in the shallow aerobic sand aquifer at the Canadian Forces Base Borden. A mixture of groundwater containing dissolved oxygenates and gasoline was injected below the water table along with chloride as a conservative tracer. He estimated a MTBE biodegradation rate of 0.0012/d based on the initial MTBE mass injected in the aquifer and the estimated mass remaining in the aquifer after 3000 days.

3) John Wilson (USEPA, Ada, Oklahoma Lab) studied MTBE natural attenuation located at a fuel farm site at the Coast Guard Support Center in Elizabeth City, NC. He measured an overall MTBE natural attenuation rate of 0.006/d to 0.014/d in a strongly reducing (methanogenic) aquifer. Dispersion/dilution accounted for only 0.0013/d reduction in MTBE concentration.

4) Paul Bradley et al. of the USGS found that MTBE was significantly biodegraded by indigenous microorganisms as groundwater passed from an anaerobic aquifer through mixed aerobic/anaerobic sediments at two different sites. They reported that up to 73% of (U-14C)-MTBE and 84% of (U-14C)-TBA were degraded to 14CO2.

5) Douglas Mackay et al. found that oxygen added to an anaerobic aquifer at Vandenberg Air Force Base, CA stimulated native aerobic microorganisms to biodegrade MTBE. In two field tests, they concluded that "native MTBE-degrading microbes, when stimulated and sustained by oxygen release to the subsurface, can degrade most of the MTBE migrating through the oxygen-amended zone".

Conclusion

As demonstrated in the five studies referenced above, naturally occurring microorganisms can biodegrade MTBE and in some cases, the rate is adequate to reduce plume size. As more research is conducted and the results of additional studies become available, the petroleum industry and the US EPA are likely to become more accepting of the fact that MTBE does biodegrade.

At present, the IPC feels that there is insufficient data to propose a default biodegradation rate greater than zero. However, since field studies have demonstrated that MTBE does biodegrade under a variety of environmental conditions, the IPC proposes that the IPCB adopt a default MTBE biodegradation rate of "zero" with contingent language that allows for development of site-specific MTBE biodegradation rates when they can be measured or calculated from historical data.

References

1. Borden, R. C., R. A. Daniel, L. E. LeBrun IV and C. W. Davis. 1997. Intrinsic Biodegradation of MTBE and BTEX in a gasoline-contaminated aquifer. Water Resources Res. 33(5) pp. 1105-1115

2. Shimer, M., J. F. Barker, and B. J. Butler. 1998. Natural Attenuation of MTBE at the Borden Field Site. Proceedings of the Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA. May 18-21.

3. Wilson, J.T., J. S. Cho, and B. H. Wilson. 2000. Natural Attenuation of MTBE in the Subsurface under Methanogenic Conditions.. USEPA, Office of Research and Development, Washington, D. C. EPA/600/R-00/006.

4. Bradley, P. M., J. E. Landmeyer and F. H. Chapelle. 1999. Aerobic Mineralization of MTBE and tert-butyl alcohol by Stream-Bed Sediment Microorganisms. Environ. Sci. Technol. 33, pp. 1877-1879.

5. Mackay, D., R. Wilson, G. Durrant, K. Scow, Amanda Smith, M. Einarson, and B. Fowler, 2000. In Situ Treatment of MTBE by Biostimulation of Native Aerobic Microorganisms. USEPA MTBE Workshop, Cincinnati, OH, January 2000.