HERCULES LANDFILL SUPERFUND SITE
TECHNICAL ASSISTANCE REPORT

EPA Toxaphene Testing Method Found Inappropriate

October 2005

Overview

The Environmental Protection Agency's Office of Inspector General recently issued a report entitled "Appropriate Testing and Timely Reporting Are Needed at the Hercules 009 Landfill Superfund Site, Brunswick, Georgia" dated September 26, 2005. This document, developed by EPA's Ombudsman, refutes Region 4 EPA's methods for analyzing toxaphene at the 009 Superfund Site and the Terry Creek Disposal Superfund Site, and at other areas around Glynn County, Georgia. Nearly 15 years of data collected on soil, air, water and biological samples tested in Brunswick are now in doubt.

Each department in the United Sates administration has an Inspector General office to provide oversight for the agency. Several years ago the Glynn Environmental Coalition formally requested an investigation on items ranging from toxaphene testing in Glynn County to questions regarding lack of compliance in the cleanups in Brunswick. This first report mainly investigates the issue of toxaphene analysis. The Office of Inspector General has concluded that the methods used by Region 4 have not and could not precisely determine the form of toxaphene found in Glynn County.

Background

The 009 Superfund Site is a former road construction borrow pit refilled with waste from pesticide manufacturing at Hercules Inc. Toxic sludge, off-grade product, and contaminated soil were deposited into the pit, some of which was below the water table at least part of the year. Although the Record of Decision—the legally mandated cleanup goals for the site--stated that all contaminated soils above 76 parts per million (ppm) would be stabilized *in situ*, the EPA allowed a much simpler cleanup of merely covering the waste with a soil/cement mixture using above-ground mixing techniques. At question are the legalities of changing cleanup plans without seeking community input, and whether or not the cleanup achieved any of the goals of the original Record of Decision.

The Terry Creek Disposal area is a marshy region at the confluence of Terry and Dupree Creeks in Glynn County that receives industrial runoff from the Hercules plant. Decades of dumping into the creek system and a series of dredging operations widely distributed toxaphene within the marshes. The main issue at this site is if toxaphene is accurately measured in seafood since the area is part of the local fishery.

In addition to the EPA regulated sites, "toxaphene-like" substances were found in the soils of local public schools and other public and private properties. Based on this Report by the EPA Ombudsman, these "toxaphene-like" materials are toxaphene congeners subject to EPA regulation. Overall, there is the major question of whether or not the EPA permitted testing giving false data on toxaphene. There

are many scientific studies showing toxaphene can be measured more accurately than the techniques used by EPA in Glynn County.

Toxaphene and its breakdown products are poisons, mutagens, possible cancer agents and they do bioaccumulate.

Toxaphene

Internationally recognized scientific studies show there are usually three different types of toxaphene: technical, weathered and biological. Technical toxaphene is the type made at the factory and sold worldwide for agricultural pest control. Technical toxaphene is not one chemical, it is a mixture of about 200 different chemicals produced by adding chlorine to camphene, a chemical made from tree resin. Different manufacturing processes produce slightly different mixtures. Although the chlorination of camphene can produce any of about 600+ different chemicals (called congeners) most technical grades have about 200 chemical congeners. Weathered toxaphene occurs after toxaphene is used. Environmental processes such as air drying, sunlight and bacteria degrade toxaphene. Since each of the more than 200 chemicals in technical toxaphene breaks down differently, weathered toxaphene varies in the types of chemicals present. Some chemicals appearing in weathered toxaphene are not found in the original technical grade of toxaphene, but they are still some of the 600+ different types of chlorinated camphenes, they are just produced from technical toxaphene by environmental processes. Biological toxaphene occurs when plants and animals absorb toxaphene from the environment. Every bacteria, plant, or animal has a different ability to absorb toxaphene congeners. Fish tissues have a different set of toxaphene chemicals from humans. Some toxaphene congeners are found often and in high concentrations (a process known as bioaccumulation), other congeners rarely occur in animal tissues. Biological toxaphene is very different from technical toxaphene, but all of the compounds found in biological toxaphene are still members of the same set of 600+ congeners found in toxaphene.

Note that Glynn County, Georgia has a fourth and fifth type of toxaphene. Off-grade product, material that was not toxic enough to sell, and residue from manufacturing, were dumped locally both in the 009 landfill and into Terry Creek. This material was not the same as technical toxaphene, but was still toxic, mutagenic and potentially carcinogenic. It is only found near the sites of manufacture, such as Brunswick, Georgia. Off-grade product toxaphene and manufacturing residue toxaphene will still weather and bioaccumulate, just like technical toxaphene.

Types of toxaphene measurements

All of the methods for analyzing toxaphene use gas chromatography or “GC.” GC separates all 600+ possible toxaphene compounds so that they can be seen and measured. There are several different measurement methods and technologies.

Total Area Method

This is the basic method required by the US EPA for chemicals with multiple congeners. It detects technical, weathered and biological grades of toxaphene, as well as the off-grade product and manufacturing residue forms. Basically, all of the possible toxaphene chemicals are detected and

added together to quantify total toxaphene. This method was not used by the EPA in Brunswick, Georgia, but is used at other EPA sites in the United States and by other governments and researchers around the world.

Toxaphene Task Force Method

This method was developed by EPA Region 4 in Atlanta, Georgia, with Hercules Inc., and the State of Georgia. While gas chromatography is still used, only a few of the chemicals specific for technical toxaphene are used in the analysis. Even if other toxaphene chemical congeners are present, they are ignored. The toxaphene task force method (known as EPA Method 8081) detects technical grade toxaphene as well as the total area method; however 8081 does not detect all off-grade products, does not detect some forms of manufacturing residue toxaphene, and can only detect weathered toxaphene in the first few years after placing in the environment. The TTF method does not detect toxaphene after it has been in the environment for several years, and it does not detect biological toxaphene. The TTF method is apparently used only in Glynn County Georgia and nowhere else in the world. The method is not recognized by other governments or by researchers as a useful method because it under-reports the actual toxaphene concentration.

GC negative ion mass spectroscopy

This technique, called the NIMS method, can detect all forms of toxaphene and is a widely respected method with a high degree of scientific merit regarding interpretation of results. It is especially useful for detecting biological forms of toxaphene accumulation. This is the method favored by the EPA Inspector General. NIMS is still not approved by the EPA.

Discussion

Quoting from page 5 of the Ombudsman's report section titled "**EPA's Method Fails to Identify Toxaphene Breakdown Products in Groundwater"**: "… *the groundwater monitoring data collected at the site, using EPA's method, only identified the original toxaphene mixture in the groundwater."* Further, same page: "*When the OIG looked at the groundwater monitoring data for evidence of toxaphene breakdown products, the OIG found some evidence suggesting toxaphene breakdown products may be in the groundwater surrounding the Hercules 009 Landfill Site."*

In Appendix A of the report the OIG shows by example chromatograms and states, in the section titled "**EPA Method 8081 Does Not Identify Toxaphene Degradation Products"**: "…*EPA Method 8081 fails to detect toxaphene degradation products (i.e., "weathered" toxaphene or individual toxaphene congeners) in environmental samples."* Method 8081 is the method produced by Region 4 EPA's Toxaphene Task Force using the subset of toxaphene congeners.

The Ombudsman report also notes that EPA is required to monitor toxaphene degradation products. On page 21 in the section titled "**Superfund's Remedy Requires the Evaluation of Toxic Degradation Products"**: "*Therefore, the Superfund's MNA [Monitored Natural Attenuation] guidance requires EPA to anticipate and to test for the presence of potentially toxic degradation products at hazardous waste sites. Since toxaphene is known to degrade in the environment and these degradation*

products are thought to be toxic, EPA must evaluate the groundwater at the Hercules 009 Landfill site for toxaphene's degradation products…"

The Ombudsman report noted other problems with the conduct of sampling by the EPA in Brunswick. An addendum to the report discussed potential problems with the cleanup of environmental samples using sulfur, and a second problem with heat settings on the instrument. Sulfur can interfere with the analysis, some instrument temperature settings fail to detect toxaphene. In combination with the inability of methods used by EPA to quantify weathered toxaphene, the potential biases of the cleanup and column temperature means that much of the data used by EPA to design and verify Superfund cleanups are doubtful.

The Report also cites comprehensive toxicology and body burden studies on toxaphene congeners conducted at a variety of laboratories. Notable among these is the MATT study (Investigation into the Monitoring, Analysis and Toxicity of Toxaphene in Marine Foodstuffs, 2000) describing the bioaccumulation of specific toxaphene environmental end-products in commercial fish species. EPA Region 4 should have been aware of these studies—it is their responsibility to follow the scientific literature. Region 4 should have responded to the growing body of literature regarding toxaphene years ago. In addition to criticizing toxaphene analysis the OIG report also faults EPA on lack of timely reporting, failure to make key decisions, and notes unacceptable modifications to "independent" third-party reviews before release to the public.

Concluding Remarks

For more than a decade EPA Region 4 used the toxaphene task force method (EPA Method 8081) in Glynn County despite research showing the method does not give valid data on environmental toxaphene. At this point it is not clear if cleanups at the 009 landfill and Terry Creek Outfall meet the legal remediation goals. It is not clear because EPA has used an unreliable method that cannot measure the types of toxaphene found in water and soil.

It is fair to say much of the data on toxaphene occurrence and exposure is "inconclusive" for samples taken in Brunswick and tested by method 8081. Not all of the thousands of samples examined so far are in error—obviously many observed both technical toxaphene and some forms of weathered toxaphene. However, virtually all of the groundwater and soil samples need retesting to verify the presence or absence of weathered toxaphene.

EPA is proposing developing new methods using the NIMS method advocated by the Inspector General. While there may be some debate over methods, one thing is crystal clear: EPA Region 4 should not be the agency to produce and validate any new toxaphene method. The Atlanta, Georgia EPA office is far too biased to be trusted with developing toxaphene methods.

Written by R. Kevin Pegg, Ph.D.; edited by Dr. Mary S. Saunders. Copies of the newsletter are available from the GEC, at the Glynn County library, or at **www.enviro-issues.net** on the Internet.

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