Northeast GAS ASSOCIATION

NYSEARCH

Technology Brief

Management of Polycyclic Aromatic Hydrocarbon (PAH) Impacted Sediments

Description: **A program to establish a new analytical method for measuring PAHs in sediments near MGP sites with greater accuracy and validity.**

Status: **Final ASTM and EPA standard methods have been issued.**

BENEFITS

This project establishes a scientifically defensible and approved method for determining PAH contamination in sediment pore water. The new method determines the presence of bioavailable PAHs more accurately; thereby significantly reducing false positive and false negative indications of contamination. Use of the new method for determining site-specific clean-up goals for PAH-impacted sediments will yield smarter remedial decisions. As a result, it will offer greater protection of the environment and reduce site remediation costs.

BACKGROUND

Manufactured Gas Plants (MGPs) were industrial facilities that produced heating/ lighting gas from coal, oil and other feedstock. Coal tar or NAPL (Non-Aqueous Phase Liquids) is a dense oily liquid by-product from the gas production process at MGPs. It was occasionally disposed of via on-property pits or other land disposal activities; which in some cases contaminated soil, groundwater, surface water, and sediments near former MGP sites.

Coal tar contains a number of chemical constituents that are a potential concern in the environment when left untreated. These constituents included polycyclic aromatic hydrocarbons (PAHs).

Although utilities no longer operate MGPs, sediments adjacent to MGP sites may still contain elevated concentrations of PAHs. In 1998, the NYSDEC (New York State Department of Environmental Conservation) established a screening level guidance value of 4 mg/kg total PAHs to identify contaminated sediments.

The toxicity of PAHs to organisms living in sediments is not well understood. Not all PAHs are available to sediment organisms. The fraction of PAH in the sediment that is "available" to an organism has been found to vary greatly from site to site. Therefore, a better understanding of PAH sediment chemistry, bioavailability, and toxicity is necessary to develop a cost effective environmental remediation of sediments at MGP sites.

TECHNICAL APPROACH

The NYSEARCH sediment research program sets out to understand MGP sediment chemistry and establish why sediments with similar PAH concentrations differ in toxicity from site to site. Initially, a review of the evolution of PAH regulatory policy and science was conducted. This review documented the evolution of the current regulatory guidance for sediment management in New York. The current regulatory guidance includes the use of generic screening levels for the identification of impacted sediments. It was observed that non-toxic sediments with high concentrations of contaminants and toxic sediments with low concentrations of contaminants do occur. Therefore, the review showed that the technical basis for these screening levels requires understanding the bioavailability of sediment-bound contaminants.

To increase the scientific understanding of chemical bioavailability and its use for site-specific remediation decisions, a multi-industry group referred to as the "Sediment Contaminant Bioavailability Alliance", or SCBA, was formed.

This alliance was established to develop and evaluate site-specific measures of contaminant bioavailability for sediment management. The goal of the alliance is to increase the scientific understanding governing chemical exposure and toxicity in sediments. This is accomplished via an ongoing site-specific chemical and biological database which serves as the basis for regulatory guidance on the use of direct chemical measurements of contaminant bioavailability for sediment management. As part of this effort, field sediment samples have been acquired

Figure 1: Ponar Grab Sampler for Retrieving Sediment Samples

(Figure 1), analyzed and evaluated from (16) MGP and aluminum industry sites. The program focuses on field samples since they reflect the complexity of the environment and provide a true test of the capabilities of the proposed chemical measures of bioavailability. An inter-laboratory validation study was performed to provide a statistical foundation to the use of the new method for measuring PAHs. Literary publications were developed in order to provide regulators and industry with a reference from reputable sources. Guidance was provided to state and federal regulators through regulator involvement via technical review meetings and demonstrations. This approach addressed regulator concerns while efficiently achieving project goals.

PROGRAM STATUS

Data has shown that toxicity to aquatic organisms is not related to the concentration of total extractable PAHs in sediments using EPA standard methods. Instead, toxicity is correlated to the concentration of bioavailable PAHs measured using a newer analytical method and solid-phase microextraction (SPME) of sediment pore water (Figure 2). Using this correlation, it is now possible to better predict the exposure

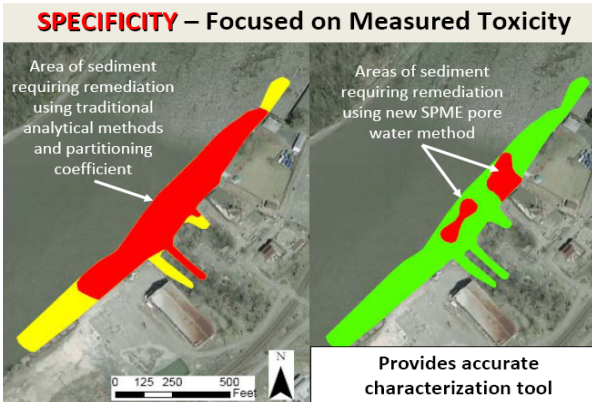

Figure 2: New Analytical Method

and toxicity of PAHs (Figure 3), and perhaps other hydrophobic organics, such as PCBs, in sediments. Bioavailability data can be

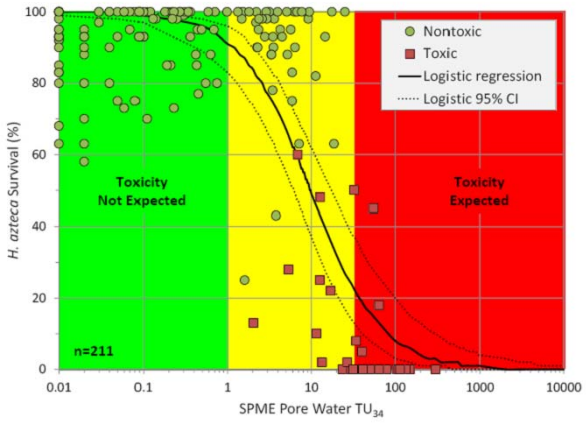

Figure 3: The Distribution of Toxic and Non-Toxic Samples Using the SPME Method

incorporated into predictions of chemical exposure and subsequent remedial decisions for sediments and soils. A new ASTM standard D-7363-07 and an EPA Method Number 8272 have been assigned.

Highlights

New Method from Program

- Detects contamination more accurately
- Achieves more thorough environmental remediation
- Save costs on unnecessary dredging

For more information contact:
admin@NYSEARCH.org