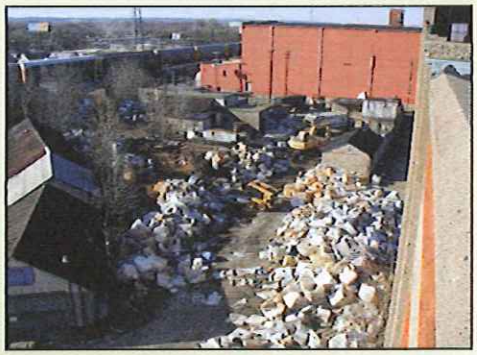
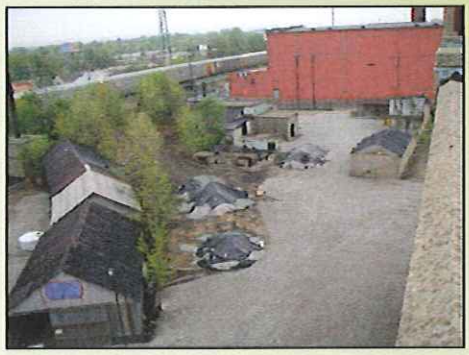
Kentucky Division of Waste Management
Annual Report
Fiscal Year 2010

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Kentucky
UNBRIDLED SPIRIT

Division of Waste Management Highlight

BOS 200® Trap and Treat
Method and Product

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In Kentucky, clay and tight silty soils with related subsurface water represent the most predominant type of setting impacted by petroleum underground storage tank contamination. Cleanup efforts within this scenario can be the most challenging and time consuming due to the natural rate at which water can migrate through these tight soil types. Water movement through tight soils like clay and silt is extremely slow. This, on a positive note, is why subsurface contamination within them does not typically move very far and is limited to localized areas. However, if the contaminated soil cannot be removed through over-excavation for various reasons, the cleanup effort, by other means, can be extremely difficult and time consuming. Why? The driving challenge in the cleanup of soils on-site becomes how to get to the contamination itself within the soil and associated subsurface water for treatment or removal given the extremely slow movement rates.

Technologies and methods to clean up soils either treat or remove the contaminants themselves directly while leaving the soils in place. These two concepts use one of three methods to accomplish the goal; mechanical injection/removal, chemical treatment or biological treatment (or a combination thereof).

A relatively new method and product that has come onto the scene is the application of BOS 200® (a.k.a. "trap and treat"). This remedial concept is not just a technology or product, but a strategy that combines an injection plan and method with the BOS 200® product. The trap and treat method using BOS 200® has two primary strategies that work together: (1) the injection plan and method, and (2) the ability to use mass transfer while maintaining that dynamic well after application.

For the injection plan and method it is essential to identify the core vertical and horizontal mass of petroleum contamination (hydrocarbons) within the soil. This mass within the soil is serving as a source for most, if not all, of the dissolved phase contamination in the associated subsurface water. This mass is typically situated in the unsaturated and saturated soils, and supplies the more fluent groundwater with hydrocarbon contamination that may be dissolved into it. It is critical to locate this zone in order to best calculate the appropriate quantity to inject and to identify the appropriate zone in which to inject. Once this zone is identified, high pressure injections at appropriate vertical intervals, between strategically placed borings, spaced horizontally, creates an intertwined network of fractures within the clay or silt to more evenly distribute the BOS 200® where its chemical and biological process can work.

The BOS 200®'s chemical and biological process itself creates localized 'sinks' in the injected areas using carbon that is pre-saturated with microbes and nutrients. Hydrocarbons have a strong attraction to carbon which triggers the initial action of drawing in the hydrocarbons to the microbes within the pre-saturated carbon. The microbes, in turn, digest the hydrocarbons over time while increasing their own numbers. The hydrocarbon digestion of the microbes reactivates the spent carbon which pulls in more of the hydrocarbons to be digested. This cyclic action is regenerated rather than being depleted rapidly after an initial injection. This technology offers two continuous actions working together to decrease the hydrocarbons over time via mass transfer from the soils and associated subsurface water: 1. The carbon adsorbing the hydrocarbons onto itself. 2. The microbes digesting the adsorbed hydrocarbons that in turn recharge the carbon. Therefore, the "shelf life" of this technology is extended, based on this continuing cycle, as opposed to many other injected treatment agents that are spent soon after injection.

While all methods and products have their limitations, the appropriate application of the trap and treat strategy using BOS 200® shows promise as an effective remedial strategy. A critical element to the successful use of this technology is a sound and accurate conceptual model of the subsurface dynamics at play at a given site in order to design an effective application strategy. More importantly, however, it reveals a general methodology that can be more broadly applied with other injection products to increase their potential for success.