Bioremediation of Landfill Off-site Contamination - Summary

Background

The City of Ann Arbor maintains a closed municipal landfill located on the south side of Ellsworth Road. A chlorinated solvent (vinyl chloride) was released from the landfill into the groundwater sometime during the active life of the landfill which ended in 1986. The vinyl chloride plume extends north in the direction of the groundwater flow into the city's Southeast Area Park. During the 1990s, the city installed a slurry wall around the landfill to prevent clean groundwater from mixing with potential contaminants in the landfill and then carry the concentrations down-gradient. The slurry wall was not extended across 1,500 feet of the northern side of the landfill. Instead, extraction wells were installed that continually operate; pulling the groundwater and contaminants back to the extraction wells where the water is discharged to the sanitary sewer for treatment. The vinyl chloride plume has maintained a relatively similar shape and shown decreasing concentrations over the last decade; however vinyl chloride concentrations remain above applicable environmental criteria.

Although this is an effective method of removing vinyl chloride, other strategies could be employed that are generally quicker, more sustainable, require less infrastructure, use the existing microbial community and are US Environmental Protection Agency approved technologies for remediating chlorinated solvent plumes. This type of remedial process is generally referred to as bioremediation, where naturally occurring microorganisms are given food and nutrients to encourage the metabolic breakdown of the contaminant. In this case, a group of microorganisms - known as halorespiring bacteria - use chlorinated solvents to 'breathe' instead of using oxygen. Once the vinyl chloride or other chlorinated solvent is metabolized by the bacteria, harmless byproducts are left in the groundwater including ethene.

Proposed Approach

A bioremediation pilot test is being proposed for a portion of Southeast Area Park to determine the effectiveness of this technology on the existing vinyl chloride plume. Groundwater samples collected from Southeast Area Park were genetically analyzed. The halorespiring microorganisms are currently present in the subsurface, although the population is too small to encourage the breakdown of vinyl chloride because they lack a food and nutrient source. In this proposed bioremediation pilot test, both a food source (emulsified vegetable oil) and an additional microorganism population would be added to the subsurface. The emulsified vegetable oil is a natural, food-grade substrate that will be added to the aquifer through eight

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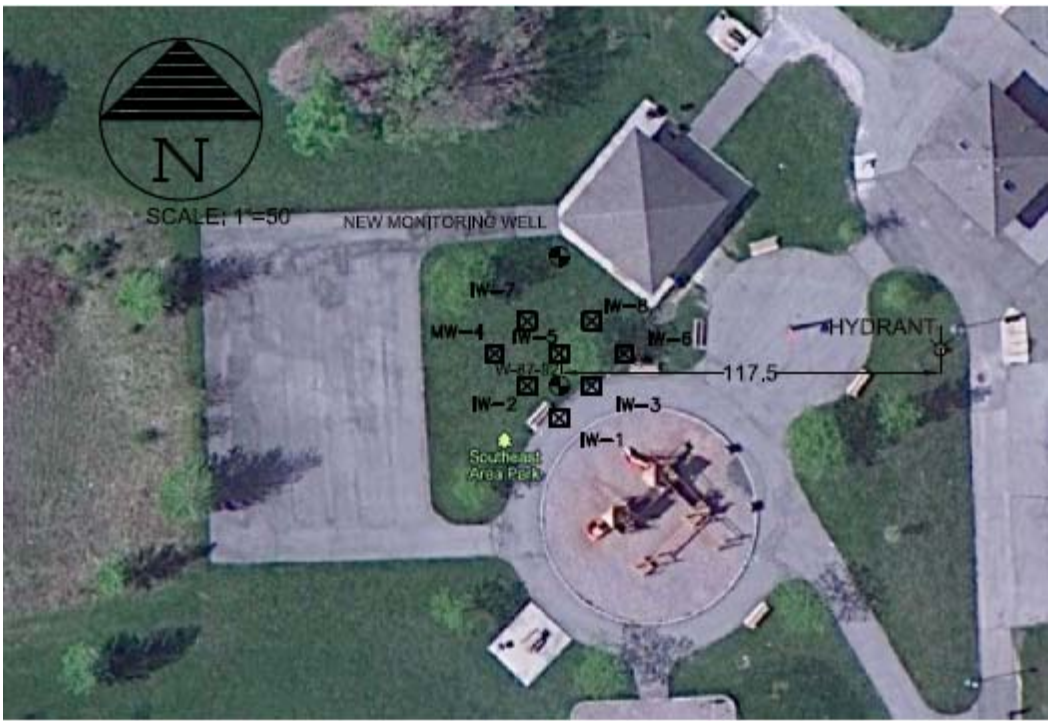
injection locations, followed by a flushing of water that helps distribute the oil. After 4 to 8 weeks, the additional microorganisms will be added to the aquifer through the same eight locations, to stimulate the existing population, thereby promoting the breakdown of the remaining vinyl chloride. The proposed area of the park is pictured below.



Park Impacts

The park area will be affected for three days. We anticipate a day to drill the test wells (flush mounted) and a day to inject the soy oil using water pressure from the local hydrant. The area will be fenced off but the park will remain open. After the soy injection, the injection system above ground will be removed. After a 4-6 week waiting period, additional microorganisms will be injected by hand at each well site. After this, there will be regular monitoring to examine the efficiency of the remediation. The contamination is 25 feet below ground and we do not believe that the contamination will reach the surface because of any of the proposed activities.

Role of PAC

Staff is looking to PAC for a recommendation on whether or not to pursue this bioremediation approach.