Geospatial Screening Method to Identify Sewer Gas Inhalation Exposure Risks near Hazardous Waste Sites

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Background/Objectives. Hazardous waste sites are both numerous and widespread within the United States. Currently, there are approximately 1,340 sites on the National Priorities List; however, these comprise only a small fraction of the more than 400,000 total sites awaiting cleanup across the country. Contaminated environmental media (e.g., groundwater, soil, and air) at these sites present both environmental and human health risks for nearby populations. Vapor intrusion (VI) is a well-documented issue at many of these locations. The entry of contaminant vapors into indoor air environments creates a public health problem due to potential inhalation exposure risks. Recent research has demonstrated that the presence of preferential pathways, such as sewer lines, may exacerbate the geographic extent and health risks of VI at hazardous waste sites. In the United States, there are nearly one million miles of public sewer mains and half a million miles of private lateral sewers. A considerable portion of these pipes is in poor structural condition. Pipe deterioration allows infiltration of contaminated groundwater and vapors into sewer systems near hazardous waste sites.

This research project involves the development of a screening-level method to identify crucial locations where additional evaluation may (and may not) be warranted. A geospatial tool that combines geographic information system (GIS) maps of sewers and hazardous waste site locations provides insight about where exposure risks are greatest based on available information from city and regulatory databases. The tool can be used to identify locations where sewer repairs and other mitigation efforts are most needed so that exposure risks can be reduced.

Approach/Activities. The approach involves 1) compiling data related to the hazardous waste sites, sanitary sewer systems, and surrounding environment/infrastructure; 2) evaluating this data using GIS analysis techniques to determine susceptibility of sewer reaches to infiltration of contaminated groundwater and vapors; 3) verifying screening results through field sampling of selected sewer reaches; and 4) improving the screening tool using field data.

Results/Lessons Learned. Preliminary screening demonstrates a high potential for sewer pipes surrounding the selected study sites to be deteriorated and impacted by elevated volatile organic compound concentrations. The results of this study will highlight sewer reaches that should be prioritized for rehabilitation or replacement based on performance and capacity to increase exposure risks in indoor air. Given the ubiquity of hazardous waste sites and aging wastewater infrastructure, many sewer systems capable of transporting subsurface contaminants long distances from source sites may exist in the United States; however, this tool provides information about how to prioritize which sewer systems are most likely to pose exposure risks and should be targeted for mitigation or additional evaluation.