Sewer Ventilation as a VI Mitigation Alternative: Case Studies

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Background/Objectives. Vapor intrusion (VI) practitioners are increasingly concerned about the role of atypical preferential VI pathways (APPs), such as subsurface utilities (e.g., sewer lines), for the transport of volatile organic compounds (VOCs) from the subsurface to indoor air. APPs are of concern because they can lead to: 1) VI in structures not overlying subsurface contamination and can result in higher indoor concentrations than would otherwise be expected; and/or 2) VI in structures that would not be expected via vadose zone transport and diffusion/advection of vapors into the building. VI through sewers presents a unique mitigation challenge since typical VI mitigation technologies, such as subslab depressurization (SSD), may not be effective in mitigating VI through APPs. Sewer ventilation is an effective way to mitigate VI through this APP as presented in these case studies.

Approach/Activities. At Site A, indoor air sampling was conducted in a barracks located 100 feet upgradient from the edge of the shallow groundwater plume. Concentrations of trichloroethene (TCE) were periodically detected above screening levels. Tetrachloroethene (PCE) was also detected, but at concentrations below screening levels. However, concurrent subslab soil gas concentrations would not be expected to result in the observed indoor air concentrations. Based on the initial sampling results, a follow-on investigation was conducted using a HAPSITE gas chromatograph/mass spectrometer (GC/MS) and building pressure cycling. The investigation confirmed the sewer was the likely source of VI into the building. At Site B, residential indoor air sampling near a military installation identified multiple residences with a possible APP. The residences were not within 100 feet of the known plume boundary and have SSD systems. Despite the presence of the SSD systems, indoor air TCE concentrations periodically exceeded the site-specific action level. Similar to Site A, an investigation using a HAPSITE GC/MS confirmed an APP at one residence to be the sewer pipes. The main sewer line conveys permit-compliant contaminated groundwater from a nearby military installation to a public water treatment facility.

At both sites, a two-phase pilot study was conducted to assess whether ventilation of the sewer line could reduce VOC concentrations within the sewer line, thus reducing the concentrations in building plumbing and, by extension, indoor air. Phase I consisted of a temporary ventilation test and permanent systems were installed during Phase II. Baseline sampling was conducted following permanent blower installation and post startup quarterly performance monitoring events were conducted.

Results/Lessons Learned. The results from both sites indicate that sewer ventilation is an effective technique to mitigate VI through sewers. At Site A**,** concentrations of PCE and TCE, both within the sewer manholes and within plumbing have been reduced by up to 99 percent. At Site B, TCE concentrations within the sewer line were reduced by 79 percent to 95 percent after 98 minutes of ventilation. At both sites, indoor air concentrations of the target compounds have been reduced to concentrations well below screening levels.