Re-evaluating Vapor Intrusion "Cold Case" Sites Using Rapid, Community-Wide Indoor Air Screening

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Background/Objectives. A 15-acre RCRA Corrective Action site located in Johnson County, Indiana (Site) was used for electrical part manufacturing including vapor degreasing from approximately 1961 to 1983. Historical Site documents indicate wastes leaked through the facility's floor to underlying soils and were also discharged through a cracked sewer line. A trichloroethene (TCE) and tetrachloroethene (PCE) dissolved-phase groundwater plume was discovered migrating south of the Site into an adjacent residential neighborhood, closely following the sanitary sewer line. Human health exposure and groundwater migration were identified as "controlled" at the Site in 2000, after soil remediation activities and installation of a groundwater recovery and treatment system were completed in 1995. During a 2018 review of the Site, it was noted that no vapor intrusion (VI) investigations had been conducted despite lingering community health concerns. In coordination with a local citizens group, Sampling and Analysis Plans were developed for several phases of VI investigations in residential homes. A large set of residences were rapidly screened for VI concerns using a mobile laboratory setup, followed by a multi-residence comparison of three 24-hour sampling technologies which is uncommon in a field study setting.

Approach/Activities. 24-hour indoor air sampling was conducted at twenty (20) residences between June – October 2018 using traditional Summa-type air canisters supplemented with passive samplers. Apparent VI concerns were identified in multiple residences located south (downgradient) of the Site, with indoor air concentrations of TCE and/or PCE in exceedance of Indiana regulatory criteria, though vapor entry points were not clear. An enhanced sampling plan was implemented in February – March 2019 to repeat testing where possible at previously sampled residences and expand the investigation to include additional residences further downgradient and upgradient of the Site. Thirty (30) residences of varying construction features were screened in the field via grab air samples collected from multiple indoor rooms, crawl spaces/basements, and sewer cleanouts using glass syringe samplers. Grab samples were analyzed in near-real time by a VaporSafe gas chromatograph system, transported by an RV converted into a mobile laboratory. 24-hour real-time continuous monitoring was then conducted at select residences with the VaporSafe system operating in automatic mode. Summa-type air canisters and Radiello RAD-130 passive samplers were paired with some of the VaporSafe sampling locations to compare measured vapor concentrations across different sampling technology types and EPA Test Methods (TO-14, TO-15, and TO-17). Local barometric pressure and temperature were tracked during the sampling periods.

Results/Lessons Learned. Real-time continuous monitoring revealed variability in indoor air TCE and PCE concentrations in several residences in a manner that the traditional time-weighted average sampling technologies were not able to demonstrate. In some cases, continuous monitoring recorded key exposure times when concentrations spiked above regulatory criteria while the time-weighted average technologies reported results as non-detect. Data from the VI investigations at this Site resulted in the U.S. Environmental Protection Agency requiring additional groundwater/sewer remediation and mitigation in affected residences. Identifying patterns of intrusion efficiently are valuable at sites of this nature wherein many years have passed between site closure and re-evaluation for VI concerns to avoid additional delays, prolonged exposures and potential underestimation of health risks.