Considerations for Long-Term Monitoring of a Sewer Ventilation System for Ongoing Assessment of the Vapor Intrusion Pathway

Jessica H. Persons, P.E. (Jessica.High@ch2m.com) (CH2M, Whitefish, MT, USA)
Loren Lund, Ph.D. (CH2M, Shelley, ID, USA)
Keri Hallberg, P.E. (CH2M, Charlotte, NC, USA)
David Cleland, P.E. (NAVFAC, Norfolk, VA, USA)

Background/Objectives. Atypical preferential pathways (APPs), such as subsurface utilities (e.g., sewer lines), are increasingly being evaluated by vapor intrusion (VI) practitioners to assess their role in the transport of volatile organic compounds (VOCs) from the subsurface to indoor air. APPs can potentially lead to VI within buildings without impacting subslab vapor concentrations since they can act as a conduit for vapors. Vapors in APPs may also travel further distances from the source to a building than the typically 100-foot lateral inclusion zone. Recent studies conducted indicate that sewer ventilation is an effective alternative to mitigate VI through sewer APPs. Results of a recent sewer ventilation pilot study at the subject site corroborate the effectiveness of this approach, however, inherent challenges were identified during long-term operations that triggered consideration for more comprehensive monitoring methods and longer-term assessment of the effectiveness of sewer ventilation as a VI mitigation technique.

Approach/Activities. To mitigate the sewer VI pathway at the subject site, a pilot study was conducted to assess whether ventilation of the sewer line could reduce concentrations within the sewer line between the source area and the building, thus reducing the concentrations in building plumbing and, by extension, indoor air. The effectiveness of the pilot sewer ventilation system was initially assessed through HAPSITE analysis, building pressure cycling, and sampling of VOCs in blower exhaust, manholes, and plumbing within the building. Four post-startup quarterly performance monitoring events were then conducted by examining blower pressure, flow rates, and blower exhaust, manhole, and indoor air VOC concentrations to determine the continual effectiveness of the sewer ventilation system. Based on the pilot study success, the system was approved for longer-term operation. Long-term monitoring of the sewer ventilation system was therefore initiated and included routine checks of blower pressure, flow rates, and continued monitoring of the blower exhaust, manhole, and indoor air VOC concentrations.

Results/Lessons Learned. Results of the sewer ventilation pilot study indicated that the system has effectively reduced sewer vapor concentrations of tetrachloroethene (PCE) by approximately one order of magnitude and trichloroethene (TCE) to non-detect levels. TCE was not detected and PCE was not detected above the screening levels for over one year following system startup. During one significant weather event (e.g., winds gusts of 30 mph), TCE was detected in indoor air slightly above its conservative chronic-based screening level, but was less than its screening level during follow-on sampling. Therefore, average TCE indoor air concentrations are below the conservative screening level. There is some uncertainty if the higher TCE result measured during the significant weather event was due to temporal variability or re-entrainment of sewer exhaust into the building through open windows, which has the potential to warrant treatment of the sewer exhaust. Further assessment of differential pressures within the sewer and concentrations in the building plumbing is currently underway to identify the optimal performance parameters needed to better understand factors that affect the performance of the sewer ventilation system regardless of significant weather events, such as rain and wind.