C38 Vapor Pathway Measurement Strategies/Lessons Learned

Dominic L. DiSalvo, BA, ME, Malcolm Pirnie, Inc., 104 Corporate Park Drive, White Plains, NY 10602*

After attending this presentation, attendees will have an understanding of sampling and analytical strategies used to measure volatile organic compounds in soil vapor and crawl spaces below occupied buildings.

This presentation will impact the forensic community and/or humanity by demonstrating the importance of developing detailed sampling and analytical strategies for measuring vapor pathways.

This presentation will provide an overview of sampling and analytical strategies used to measure and evaluate volatile organic compounds (VOCs) in potential vapor pathways from contaminated groundwater/soil to indoor air. These strategies are based on experience gained by Malcolm Pirnie in vapor pathway measurements on a wide array of sites with groundwater and soil VOCs. Unfortunately, the same VOCs (such as tetrachloroethylene – PCE) that are found in contaminated groundwater and soils may also be found in the occupied space in buildings from other commonly used sources, such as dry cleaning brought home by a homeowner. This complicates the identification of the source of the VOC in the indoor air and its impact on the occupants. Therefore, indoor air sampling is considered a last resort, and is typically preceded by extensive subsurface soil vapor investigations that can assess a VOC levels below the ground surface.

The first step in developing the sampling and analytical strategy was to establish the criteria to be used to evaluate if a vapor pathway exists and if so, what information is needed to estimate indoor air quality and potential health risk. Health risk-based VOC screening levels for indoor air and attenuation factors for projecting the impact of soil vapor on indoor air quality were determined, then the laboratory requirements for vapor analyses, including methodology, method detection limit (MDL), and quality assurance/quality control (QA/QC), could be established. Since the MDL selected for the project was below the parts per billion range by volume, special consideration was given to the sampling train (Summa canister with accoutrements) selection and laboratory certification process to assure cleanliness.

The second step was to understand the site and local area environmental conditions that can cause or contribute to a vapor pathway. These included soil conditions down to groundwater, building construction, subsurface preparation (backfill), utilities, proximity to the contaminated groundwater or soil, and meteorological conditions. Once these environmental conditions were understood and screening levels established, Malcolm Pirnie developed a sampling plan to collect representative samples of air located below the building and in ambient air and, on occasion, inside of buildings. This included sampling the air in open and closed crawl spaces beneath structures plus soil vapor in soils beneath slab-on-grade residential/industrial foundations using soil probes angled beneath the foundations or inserted below the foundation through holes drilled through the foundation. The sampling location selection and preparation was crucial to establishing representative samples of existing vapor pathways with minimum disturbance of on-site conditions.

The implementation of the sampling and analytical plan required significant logistical coordination and project oversight. The preparation of clean sampling trains and their monitoring during sampling were critical to the success of the plan. Integrated sampling (over 8 to 24 hours) limited potential room for error in sampling train flow calibration and tightness testing. Outside sampling also was influenced by weather conditions. The cases that will be discussed allowed Malcolm Pirnie to test the sampling trains to their extremes while providing the needed analytical data.

Malcolm Pirnie has used the expertise gained sampling vapor pathways on contaminated sites to develop more efficient, effective and representative sampling and analytical strategies. The lessons learned from vapor pathway measurements have been shared with regulatory agencies and should assist the profession to provide guidance on sampling and analysis.

Vapor Pathway Measurements, Soil Vapor, Gas Screening

 ** Presenting Author*