

# Using Converging Lines of Evidence to Evaluate Subsurface-to-Outdoor Air Pathway

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Indoor air can be impacted by volatilization from subsurface (soil and/or groundwater), by movement of air from outdoor to indoor, and by occupational sources (construction material, renovations, operations, personal, etc). Numerous air samples have been collected and analyzed at a Superfund site in Northern California to evaluate the potential for VOC vapors to migrate from the subsurface into buildings and into outdoor air. As part of the evaluation, the following types of samples were collected: indoor air samples, *outdoor air samples within the site*, and *background outdoor sample* at a distance of 0.25 to 1.5 miles away from the site. The talk evaluates one pathway by presenting several converging lines of evidence showing the subsurface at the site is not a significant source of TCE to outdoor air, and hence, the outdoor air does not contribute significant concentrations to indoor air.

These lines of evidence are:

- 1: Comparison of statistical parameters for outdoor and background air samples collected at the Site: The parameters include the arithmetic mean, the geometric mean, the median, the standard deviation, the 90<sup>th</sup> and 95<sup>th</sup> percentiles, the maximum, and the minimum.
- 2: Statistical analyses comparing the outdoor and background concentrations: Statistical analyses were performed on the data to check for statistically significant differences between outdoor and background TCE concentrations. The analyses included a non-parametric test, as well as an analysis of variance test.
- 3: Simulation of the groundwater-to-outdoor air potential pathway: The RBCA Tool Kit was used to simulate the potential contribution of the groundwater plume to an outdoor point of exposure on top of the plume (i.e., the modelled horizontal distance from the plume to the point of exposure is zero).
- 4: Simulation of the soil-to-outdoor air potential pathway: The RBCA Tool Kit was used to compute the outdoor air concentration onsite at a point of exposure on top of the soil. However, because the remediated soils are at some distance from the residential area, the Tool Kit was also used to compute the concentration in air at another point of exposure in the residential area 300 meters from the soil.
- 5: Estimation of outdoor air concentrations from flux measurements: 11 flux measurements were taken, and the outdoor air concentration was calculated by combining the flux measurements with a dispersion factor (U.S. EPA, 1996, Soil Screening Guidance: Technical Background Document).

The converging lines of evidence showed that the groundwater plume and the soil are not significant sources of TCE to outdoor air.