Accounting for Background Sources for Risk-Based Decision Making at Vapor Intrusion Sites

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Background/Objectives. At sites with volatile organic compound (VOC)-impacted soil or groundwater, VOCs detected in indoor air may be from subsurface sources through vapor intrusion (VI) or from background indoor and ambient air sources that are unrelated to site contamination. Identification and removal of potential background sources prior to sample collection is challenging even when a thorough building survey is conducted. Consequently, distinguishing compounds that are vapor intrusion (VI)-related from those that are due to background sources is an important step in interpreting indoor air sample results.

The objective of this work was to facilitate risk-based decision making by accounting for background sources during VI risk evaluations conducted at 22 buildings across three sites at Naval Air Station North Island. A clear, logical process was developed to identify compounds that are not VI-related and utilize this information for calculation of risk.

Approach/Activities. The investigation at each building included the collection of indoor air, outdoor air, and sub-slab soil gas samples after conducting a building survey and preliminary screening with a portable gas chromatograph / mass spectrometer (GC/MS). A multiple-lines-of-evidence (MLE) approach was implemented to identify compounds in each building that are not VI- related. The MLE assessment included (i) comparison of indoor air concentrations to outdoor air and sub-slab soil gas results, (ii) comparison of indoor air concentrations to indoor air background levels reported in literature, and (iii) a concentration ratio analysis (i.e., comparison of relative concentrations in each media for the primary subsurface contaminant of concern [trichloroethene] and common background contaminants).

Results/Lessons Learned. Results from the MLE approach, including graphical representations of the compound ratio analysis will be presented. The findings of this evaluation are used to compare indoor air inhalation risks for VI-related compounds to those for all detected compounds. This method provided an improved estimate of VI risks by accounting for the contribution of background sources and resulted in improved risk-based decision making for the site.