



LAND RESEARCH PROGRAM

PROVIDING TOOLS TO ASSESS VAPOR INTRUSION PROBLEMS

Issue:

Vapor intrusion is the migration of volatile chemicals from the soil subsurface into overlying buildings. Volatile chemicals in buried wastes and/or contaminated groundwater can emit vapors that may migrate through solid subsurface and into air spaces of these buildings. In extreme cases, the vapors may accumulate in buildings to levels that may pose fire and explosion hazards, acute or chronic health risks, or aesthetic problems.

Volatile Organic Compounds (VOCs) also may be present in the soil or groundwater due to spills from gas stations, bus stations, dry cleaning and laundering facilities, automotive repair shops, and other sites where petroleum products or solvents are stored, handled, or transferred. Environmental conditions such as a high water table, soil type, and fractured bedrock can influence the

movement of VOCs in the subsurface and result in intrusion into structures.

Scientific Objective:

The U.S. Environmental Protection Agency’s (EPA) Land Research Program in the Office of Research and Development (ORD) is conducting research and providing technical assistance to EPA program and regional offices and states in the area of vapor intrusion. Contributions include the following:

- Investigating bias (loss of VOCs) associated with methods commonly used for groundwater sampling. Typical groundwater sampling methods result in loss of VOCs and provide little information on the vertical profile of contamination. More information can be found at: www.epa.gov/ada/research/waste/research_06.pdf.

- Investigating bias associated with methods commonly used for soil-gas sampling. Soil-gas sampling can be accomplished at a fraction of the cost of groundwater sampling and much closer to a potentially impacted building, thereby minimizing concern over interpolation/extrapolation of data. More information can be found at: www.epa.gov/ada/research/waste/research_41.pdf.
- Developing a protocol and supporting data interpretation techniques for building sub-slab sampling. When used with outdoor and indoor air, and groundwater or soil-gas measurements, sub-slab sampling provides definitive information necessary to elucidate the source of VOCs in indoor air. More information can be found at: www.epa.gov/ada/research/waste/research_40.pdf.

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LAND RESEARCH PROGRAM

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- Evaluating the application and behavior of the Johnson-Ettinger Model, which is commonly used for assessment of vapor intrusion, given uncertainty concerning measured inputs and estimated parameters. More information can be found at: www.epa.gov/athens/publications/reports/Weaver600R05110UncertaintyJohnsonEttinger.pdf.
- Evaluating the role of moisture content and gas phase pressure variation on vapor intrusion through an instrumented building in Athens, Georgia. More information can be found at: www.epa.gov/athens/research/regsupport/vi.html.
- Developing a protocol and supporting mathematical modeling to assess gas permeability in sub-slab materials. This will improve the design of sub-slab depressurization systems to mitigate the impact of vapor intrusion.

Application and Impact:

Efforts by scientists in the Land Research Program include

uncertainty analysis of an indoor air screening model, sampling protocols, and studies of sampling methods.

Additional program support areas include the following:

- Assisting in developing guidance on assessment of vapor intrusion. Researchers wrote several portions of the 2002 draft guidance pertaining to site characterization and modeling. More information is available at: www.epa.gov/correctiveaction/eis/vapor.htm.
- Funding, organizing, and participating in national symposiums and internet short courses on vapor intrusion. Seminars and interactive class exercises are available at: www.epa.gov/nrmrl/pubs/625c03004/625c03004.htm.
- Providing site-specific technical assistance to EPA regional offices and states on vapor intrusion, such as document review, attendance at meetings, and formulation of written comments.

REFERENCES:

Ground Water Models Web site:

www.epa.gov/ceampubl/gwater/index.htm.

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U.S. Environmental Protection Agency. Review of Recent Research on Vapor Intrusion, EPA/600/R-05/106, Washington, DC, 2005.

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