



Vapor Intrusion & Mitigation Solutions



Using **industry-leading experts** to assess and safely resolve potential vapor intrusion challenges.

Vapor intrusion (VI), an indoor air exposure pathway associated with volatile organic compounds (VOCs) in subsurface media (soil and groundwater), is a critical challenge in the cleanup and closure of VOC-contaminated sites. VI continues to be an emerging science, and assessment, mitigation techniques and the regulatory environment are rapidly evolving. Increased regulatory and public focus on this complex exposure pathway has required our public and private clients to explore full-service integrated solutions for potential VI issues at their facilities.

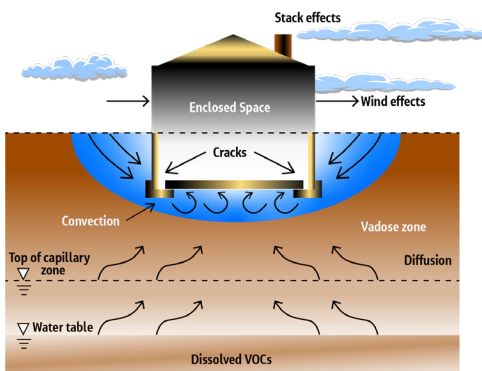
What We Offer

Jacobs offers the complete range of technical solutions needed to understand and mitigate VI pathways. Our ability to provide these services "under one roof" gives our private sector and government clients the benefit of tightly integrated, interdisciplinary teams working together to solve their VI problems.

We bring a thoughtful and collaborative approach to every one of our client partnerships to address the technical, regulatory, and public involvement challenges that can arise at VI sites, with a goal of delivering practical and cost-effective solutions that integrate innovative planning, engineering and scientific principles.

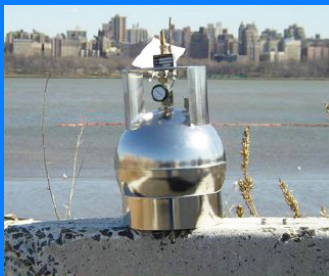
Jacobs shapes the VI practice nationally through strategic participation in national working groups. Our VI experts have presented at, organized, and chaired VI sessions at conferences, including the U. S. Environmental Protection Agency (EPA) VI workshop, Association for Environmental Health and Sciences Foundation (AEHS) annual meeting, Air and Waste Management Association VI conferences, and the Alliance for Risk Assessment Trichloroethylene (TCE) Work Group.

- **Innovative Vapor Intrusion Assessments.** Our experts are actively developing and applying innovative approaches to the assessment and decision making at VI sites. Using systematic, multiple-lines-of-evidence approaches developed by our VI experts, we have expedited investigations, facilitated development of exit strategies, and generated cost savings for our clients. We use a combination of active and passive sampling methods, such as empirical VOC and radon data, to develop regulatory-approved site-specific subsurface-to-indoor air attenuation factors. Differential pressure data and measured building indoor-to-outdoor air exchange rates, collected using ASTM International methods, have been used as additional lines of evidence for assessing the VI pathway. We also utilize the HAPSITE portable gas chromatograph/mass spectrometer (GC/MS) to provide real-time data during differential pressure evaluations and to identify background sources of indoor volatiles and vapor entry points.



- **Strategic Regulatory-Driven Solutions.** Jacobs' VI and regulatory professionals are well versed in navigating and interpreting the rapidly evolving VI regulatory programs and guidance, in the U.S. and worldwide. Regulatory requirements are often prescriptive and restrictive due to conservative assumptions used to address uncertainties related to assessing the VI pathway. VI screening or action levels are often near or below background levels or laboratory detection limits. In addition to regulatory requirements, concern and legal action from stakeholder groups provide added complexities that are costly if not managed by a VI team with the practical and regulatory experience. Our trained professionals develop regulatory-driven solutions for sites with VI concerns tailored to our clients' goals. Developing trusted working relationships with regulators and other stakeholders is a key component of how we deliver creative integrated VI solutions. Jacobs experts have been invited to train state and federal regulators and have organized panel discussions and webinars for USEPA and state regulators responsible for developing VI best practices and guidance documents.

- **Comprehensive, Turnkey Mitigation Solutions.** Our extensive resume implementing VI mitigation systems includes:
 - Design, installation, operation, and maintenance of active, passive, and hybrid VIMS, subslab and submembrane depressurization systems, crawlspace depressurization and membrane barrier systems;
 - Existing buildings and new construction (property redevelopment), from single family residences to large commercial/industrial buildings;
 - Evaluating the effects of existing heating, ventilation, and air conditioning (HVAC) equipment on the VI pathway to determine if modifications can assist in the mitigation process;
 - Planning and evaluating technical and regulatory requirements, including developing exit strategies for systems operations; and
 - System optimization for sustainability, green building solutions, and reduced long-term operation, maintenance, and monitoring.



Comprehensive Vapor Intrusion Solutions

- Site characterization for VOCs in groundwater and soil gas
- Indoor air, ambient air, crawlspace, and subslab monitoring
- Building envelope surveys
- Analytical chemistry
- Modeling, risk assessment, and multiple lines of evidence evaluations
- VI mitigation system (VIMS) and vapor barrier system design and installation
- Public involvement
- Permitting and regulatory compliance
- Pre-emptive mitigation, intrinsically safe building design, and integration with Leadership in Energy and Environmental Design (LEED)

Application of Innovative VI Investigation Technologies Saves Money and Reduces Disruption

Jacobs partnered with the U.S. Navy, the Environmental Security Technology Certification Program (ESTCP), and other nationally recognized VI experts to demonstrate innovative VI investigation technologies during our investigation of Naval Air Station Jacksonville. The methods included a building prioritization process that focused investigation efforts on 12 out of 167 buildings, use of the real-time HAPSITE GC/MS to perform rapid high-resolution sub-slab investigations, real-time sampling and analysis and long-duration passive diffusion sampling to improve understanding of temporal variability in indoor air concentrations, and use of radon testing to obtain multiple lines of evidence for assessing VI. This project demonstrated that the innovative investigation methods can provide long-term cost-saving benefits while reducing disruptions to building occupants. The innovative approach saved more than \$1,000,000.

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About Jacobs

At Jacobs, we're challenging today to reinvent tomorrow by solving the world's most critical problems for thriving cities, resilient environments, mission-critical outcomes, operational advancement, scientific discovery and cutting-edge manufacturing, turning abstract ideas into realities that transform the world for good. With \$13 billion in revenue and a talent force of more than 55,000, Jacobs provides a full spectrum of professional services including consulting, technical, scientific and project delivery for the government and private sector.

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