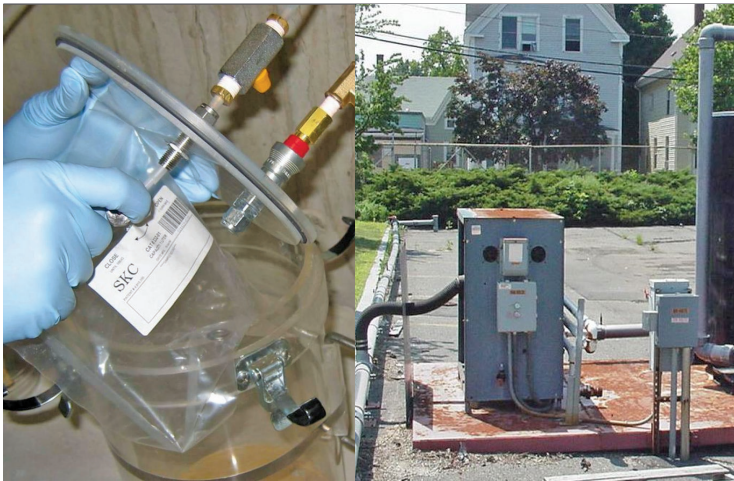
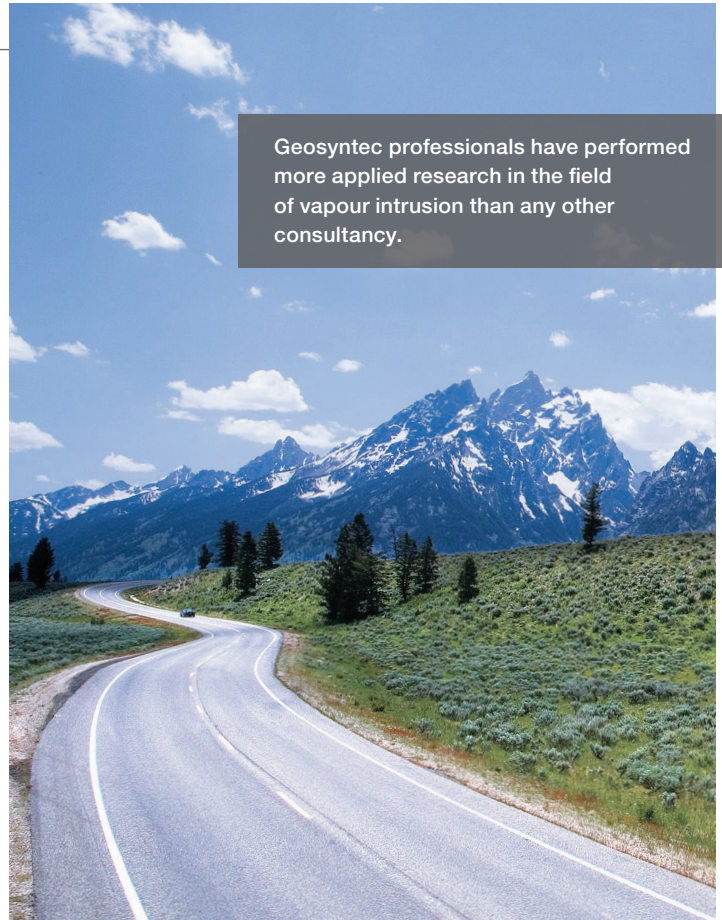


*Geosyntec has an international reputation  
as one of the preeminent consultants  
for assessing and managing subsurface  
vapour intrusion to indoor air.*

For more than 20 years, Geosyntec professionals have pioneered the assessment and management of vapour intrusion, through practice and applied research. Our practitioners co-developed the most widely used (Johnson and Ettinger, 1991) mathematical model for vapour intrusion to indoor air, pioneered soil gas sampling and analysis methods to assess vapourization of volatile chemicals from groundwater (Kerfoot, 1988), and conducted basic research into vapour diffusion through unsaturated soil (McAlary, 1988).



In the past decade we've peer reviewed and authored/co-authored many of the regulatory and industry guidance documents, including U.S. EPA (RCRA and OSWER), Electric Power Research Institute, Interstate Technology and Regulatory Council, American Petroleum Institute, New Jersey Department of Environmental Protection, and several others in Canada and the United Kingdom.



Geosyntec professionals have performed more applied research in the field of vapour intrusion than any other consultancy.

- Only firm with 3-D modelling of vapour intrusion that incorporates a bio-attenuation component for estimating the magnitude of the attenuation as a function of source concentration and source-building separation.
- First application of building pressure cycling and compound-specific stable carbon isotope analysis for forensic analysis of background source contributions.
- Developed high purge volume sampling for low cost, high quality data collection in large buildings -- minimal disruption, minimal risk of failing to identify a sub-slab source area, and maximal understanding of properties required for optimal mitigation design.
- Application of passive (wind and solar) powered systems for sub-slab venting, with innovative performance monitoring via flux measurement, and correlating flow rates to wind-speed or vacuum via analysis of the pneumatic conductivity, leakance, and specific capacity.
- Design and implementation of aerated floors for low cost vapour intrusion mitigation. Lines of Evidence include ratio analysis to discern background sources from vapour intrusion.

INNOVATIVE TECHNOLOGIES





## Our Experience Benefits Your Project Results

### AERATED FLOOR PASSIVE VAPOUR INTRUSION MITIGATION SYSTEM, JERSEY CITY, NJ

EnviroGroup Limited, a Geosyntec company, designed and oversaw installation of a passive vapour intrusion mitigation system that uses an aerated floor combined with wind and solar powered fans in a new building. Since the property was undeveloped, EnviroGroup used the existing soil vapour and groundwater data along with known site geologic information to predict the indoor air concentrations of the proposed new building, that has an aerated floor, using the Johnson and Ettinger (1991) model, with and without venting. The results of modelling indicated that passive venting due to heat stack effect and wind would likely be sufficient to reduce sub-slab vapour concentrations and meet indoor air screening levels. EnviroGroup used the evaluation results to design a vapour intrusion mitigation system, including specifying the number and locations of riser pipes, wind turbines and solar-powered fans. After the slab was poured, EnviroGroup put the entire aerated floor under vacuum and determined that the floor was tight (comparable to a spray-on liner system) and that, if necessary, a 20W fan could depressurize the entire building footprint.

Subsequent to completion of building construction, EnviroGroup conducted post mitigation baseline monitoring, which included sub-slab and indoor air confirmation tests, confirming that the aerated floor passive venting was reducing sub-slab vapour concentrations to levels ten times lower than predicted by modelling, and meeting indoor air screening levels. Currently, EnviroGroup continues to conduct operation and maintenance of the passive system (limited to system inspection and monitoring) required by NJDEP regulations.

### RISK ASSESSMENT OF POTENTIAL SUBSURFACE VAPOUR INTRUSION ADJACENT TO A MANUFACTURING PLANT, UNITED KINGDOM

This site and the adjacent area have been continuously used for 160 years as mining and manufacturing centers. Adjacent residential properties were in very close proximity to two former sandstone quarries filled with waste materials and lime slurry from former chlorinated solvent production processes. Geosyntec conducted numerous detailed studies to characterize indoor air in the adjacent residences. We included our analyses in a complete data management system detailing for the first time the nature and extent of subsurface conditions, and demonstrating vapour intrusion is limited to a fraction of the properties. The site has become a reference project in the understanding of subsurface vapour mechanisms in Europe and North American.

### ENGINEERED VAPOUR PROTECTION SYSTEM ALLOWS BROWNFIELDS REDEVELOPMENT OF CLOSED LANDFILL AS HOME DEPOT RETAIL SITE, OREGON

Home Depot identified a potential site for reuse located above a portion of a closed landfill. Their primary redevelopment requirement was protection of customers and employees from potential risks associated with landfill gas. Based on previous successful joint environmentally impacted property development projects and our building vapour protection system expertise, Home Depot selected Geosyntec to work with their design team in integrating a gas monitoring and control system into the overall site development design. Our vapour protection and detection system included designing a spray-applied geomembrane barrier layer, continuous gas collection layer, manual gas monitoring probes, and automated gas monitoring system.

### VAPOUR INTRUSION INVESTIGATION AND MITIGATION SYSTEM DESIGN IN MALAYSIA

Geosyntec used two proprietary investigative and sampling methods, High Purge Volume sub-slab testing and WMS passive quantitative samplers, to cost-effectively characterize the concentrations of VOCs in the subsurface, significantly reducing the client's costs associated with characterizing a large manufacturing facility. Passive quantitative samplers were also easier to use than traditional sampling methods considering the challenges of shipping canisters to and from Malaysia.

### WATERLOO MEMBRANE SAMPLER™

The Waterloo Membrane Sampler™ (WMS™) is a tool for measuring VOC concentrations in ambient air, sub-slab soil gas, and soil gas. Over 900 WMS™ have been sold in Australia.



## For More Information

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## About Geosyntec

Geosyntec Consultants is a consulting firm with engineers, geologists, environmental scientists, and other technical and project staff based in offices in the United States, Australia, Canada, Ireland, Malaysia, and the United Kingdom. We address new ventures and complex problems involving our environment, natural resources, and civil infrastructure.

For more information visit:  
<http://www.geosyntec.com>