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Vapor Intrusion at Retail Developments Pose Danger

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The economy has presented challenges recently to the retail real estate community. A burgeoning environmental issue – chemical vapor intrusion – may add to these challenges. Within the past year, the Massachusetts Department of Environmental Protection, the U.S. Environmental Protection Agency, and the American Society for Testing and Materials each have issued documents regarding approaches and practices for addressing this issue.

Chemical vapor intrusion – the migration of chemical vapors from contaminated soil and groundwater into buildings – at retail development projects has become an increasingly serious concern for developers, lenders, property owners, and leasers. For these stakeholders, identifying, assessing, and controlling vapor intrusion can be a complex and costly process. The impacts of vapor intrusion on indoor air quality can pose concern due to potential public health risks and liabilities.

The Issue

New retail development projects are com-

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monly being placed on former industrial and manufacturing properties, and even former military bases. New development on these “brownfields” properties allows for the retention of undeveloped “green space” and the reuse of existing infrastructure. Moreover, redevelopment of existing buildings such as mills and historical buildings, for retail, as well as residential and office space, preserves part of our industrial heritage in a service- and information-based economy.

Frequently, these “brownfields” properties have long histories of industrial and commercial uses that may have led to chemical contamination. “Due diligence” and environmental site assessments have traditionally focused on soil and groundwater chemical contamination, and the health risks from direct exposure to contaminants.

However, chemicals present in soil and groundwater can serve as a source for a secondary release of vapors through building foundations and then into the indoor air of the buildings. These vapors may then be inhaled and pose a potential health risk to the occupants of a retail building, such as workers and shoppers.

The vapor intrusion source may be linked with the past uses of the subject property. However, vapors may also travel hundreds of feet through pipes, sumps, foundation cracks, and porous materials from off-property locations, such as gasoline stations, garages, and dry cleaners.

The chemicals of concern include benzene (found in gasoline) and trichloroethylene and tetrachloroethylene (used as solvents and formerly in dry cleaning). These compounds are both common environmental contaminants and can lead to toxic effects when inhaled.

In addition to vapor intrusion as a concern

for stakeholders in retail development, the issue is an increasingly high priority for regulatory agencies and industry organizations. These groups, as mentioned above, are in the process of issuing and refining guidance and recommendations for strategies to address this issue. Vapor intrusion has also been a hot topic for environmental professional groups, such as the Massachusetts Licensed Site Professional Association and Environmental Business Council of New England, in their training sessions.

The state DEP has adopted a “weight-of-evidence” approach that combines several stages of site investigation to either establish or rule out the vapor intrusion.

The Investigation

Often the potential for vapor intrusion is identified through a review of past site uses and the analysis of soil and groundwater samples for the presence of volatile organic compounds. If VOCs are identified in these media at levels above the applicable regulatory criteria and a building is planned above or in close proximity to this VOCs area, additional investigation is required.

This investigation may involve the collection of soil gas samples from beneath the ground surface. If the subject building is already built and occupied, soil gas samples may be collected through the foundation floor and indoor air samples may be collected from locations in the basement and occupied spaces.

Several rounds of sampling may be required to determine the variability in concentrations associated with effects of weather, heating systems, and building structure, as well as contributions from other indoor and outdoor sources of vapors, such as cleaning

Continued on Next Page

Continued from Previous Page
products and auto emissions.

The collected soil gas and indoor air data are evaluated by a risk assessment specialist to quantify the degree of risk for current or future building occupants. When soil gas samples are collected, a vapor intrusion partitioning and transport model is used to predict indoor air concentrations. The risks may be calculated for different actual or potential occupants, such as a retail worker, shopper, child in a day care center, or resident.

The Solution

If potential health risks are identified due to vapor intrusion at your retail project site,

there are two general approaches to preventing chemical vapor intrusion: source control and air quality mitigation. For source control, the soil and groundwater that are serving as sources for the vapor intrusion are eliminated or reduced. For air quality mitigation, the intrusion of the vapors from the subsurface into the building space is interrupted.

Mitigation or prevention measures may include sealing of conduits (such as cracks, sumps, and floor drains), installation of vapor barriers and passive ventilation systems under the foundation, or use of active sub-slab depressurization systems. Several of these mitigation measures were used at the new Worcester Trial Court.

For new buildings, location, design, and construction of the buildings may be altered to address the vapor intrusion issue. Reuse of existing buildings may require a combination of source control and mitigation measures to ensure that public health is protected from vapor intrusion.

The chemical vapor intrusion issue presents a serious, but surmountable, challenge for retail development projects, with environmental, public health, regulatory, legal, and financial implications. However, this issue can be successfully and cost-efficiently addressed when identified and mitigated at the early stages of a retail development project. ■

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