Vapour intrusion can hurt your bottom line!

By Marc McAree, Luciella Longo and Mark Youden

Vapour intrusion, though invisible to the eye and inaudible to the ear, gives those who are aware of it, a reason to pause. Its movement, via preferential pathways into overlying buildings and other enclosed spaces, is the concern. Vapour toxicity and its potential impact on human health is the overriding peril.

Vapour intrusion results when volatile chemicals from sub-surface contaminated groundwater or soil, enter an overlying building or enclosed space. Vapours are emitted from volatile chemicals and may migrate through subsurface soil and into indoor air spaces. They follow the path of least resistance, such as cracks in a building's foundation and openings for utility lines.

Examples of volatile chemicals include volatile organic compounds, select semi-volatile organic compounds and some inorganic analytes, such as elemental mercury, radon and hydrogen sulfide.

Samples are taken from different media to assess the intrusion of vapour. Of the different media - indoor air, outdoor air and sub-slab soil gas - soil samples are the least likely to be significantly affected by background interferences. These can confound the interpretation of indoor air sample results. The challenge with soil gas sampling and analysis is the use of widely differing protocols. Environmental consultants may employ modified methods, which may lead to further differences in testing outcomes.

Railways must be careful about how they degrease engine and rolling stock, as witnessed by the Windsor vs. Canadian Pacific Railway Ltd. (CPR) case.

Regulation of vapour intrusion

In Canada, federal and provincial governments focus their vapour intrusion efforts on protecting the environment and human health. In all cases, consideration of the applicable contaminated sites regime is necessary.

At the federal level, a contaminated site is, "*one at which substances occur at concentrations above background levels and pose, or are likely to pose, an immediate or long-term hazard to human health or the environment, or exceed the levels specified in policies and regulations.*" There are no federal statutes or regulations for contaminated sites. However, the federal government has published contaminated sites and vapour intrusion guidance.

At the provincial level, "contaminated site" is not always legally defined. For example in Ontario, the assessment of contaminated sites is grounded in definitions such as "contaminant" and "adverse effect" and the application of the Records of Site Condition Regulation. However, there is no legal definition of "contaminated site". In British Columbia on the other hand, the term "contaminated site" is defined in regulation.

At the federal level, the *Federal Contaminated Site Risk Assessment in Canada, Part VII: Guidance for Soil Vapour Intrusion Assessment at Contaminated Sites* focuses on vapour intrusion analysis in two tiers. The first tier uses qualitative screening to categorize sites according to their potential for vapour intrusion. Under this tier, a determination is also made about whether the assessment should proceed to the second tier.

The second tier uses a quantitative risk assessment, where representative semi-site-specific vapour attenuation factors allow for an estimation of indoor air concentrations and prediction of human health risks. This guidance document sets out significant limitations associated with the use of soil data at sites that are contaminated with chlorinated hydrocarbons. It recommends that additional information, such as groundwater data and indoor air data, be obtained for chlorinated hydrocarbon impacted sites.

Also at the federal level, the Canadian Council of Ministers of the Environment (CCME) created a National Classification System for Contaminated Sites (NCSCS). This document functions as an important management and screening tool, for prioritizing, investigating and remediating contaminated sites under the federal program.

Recently, the CCME's Soil Quality Guidelines Task Group created a replacement for its 1993 sampling and analytical guidance documents. The 2012 draft *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment (Volume I: Guidance Manual)* has a chapter devoted to soil vapour guidance. It describes methodologies for completing site characterization programs, at sites to be evaluated for soil vapour intrusion into buildings.

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This 2012 draft guidance document was developed in parallel with similar guidance on soil vapour for the Ontario Ministry of the Environment (MOE) and Alberta Environment.

The 2012 draft *Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment (Volume III: Suggested Operating Procedures)* provides guidance on the installation of soil gas probes and the collection of soil gas and sub-slab gas samples for chemical analysis. It also sets out a suggested procedure for conducting leak testing of a soil gas probe and sampling train. The final draft of this sampling and analytical guidance document is expected to be released in late 2013.

Most provinces deal with vapour intrusion within their respective contaminated site regimes. In Ontario, the MOE has developed the *Draft Technical Guidance on Soil Vapour Intrusion Assessment.* This guidance document provides those undertaking risk assessments with tools to identify, review and evaluate sites for vapour intrusion. It specifies requirements and best practices for designing, conducting and assessing site conditions (i.e., soil vapour and sub-slab vapour quality). These allow for accurate assessments of potential impacts to indoor air quality.

This guidance document also functions as a tool for MOE staff, in identifying sites where soil vapour, sub-slab vapour and/or indoor air should be monitored, in formulating assessment requests and in issuing *Environmental Protection Act (EPA*) orders.

Recent Canadian civil cases

Windsor vs. Canadian Pacific Railway Ltd. (CPR) is about vapour intrusion from contamination caused by the use of a degreaser. The solvent, known as trichloroethylene (TCE), was used in the repair and maintenance of engine and railway rolling stock.

In September 2007, the Alberta Court of Appeal upheld the certification of a class action against CPR. The action was brought by residents of properties adjacent to a CPR maintenance and repair shop in southeast Calgary. CPR used TCE as a degreasing solvent in its maintenance shop from the 1950s, through to the 1980s.

The plaintiffs alleged that TCE from the CPR shop contaminated groundwater beneath their properties and then seeped into their homes. There was evidence before the Court that CPR voluntarily installed fans to vent the vapours. The plaintiffs are claiming damages for reduction in property values and rental values, as well as physical damage to property from remediation measures. This case is currently proceeding through the litigation discovery process.

In *Wamboldt vs. Northstar Aerospace,* a January 2006 class action was brought by Cambridge, Ontario residents, who were neighbouring property owners to the Northstar Aerospace plant. The neighbours claim that TCE contamination from the facility resulted in vapour intrusion into their homes, causing significant damage. Specifically, their claim alleges that TCE from the North-

star plant migrated into soil and groundwater beneath the plaintiffs' homes. The plaintiffs claim $200 million in damages for reduction of property value, loss of rental income and inability to obtain mortgage financing, plus $10 million for punitive damages.

Subsequent testing of indoor air revealed concentrations of TCE at levels requiring remedial action. Out of 261 residences tested between July 2005 and January 2006, 54 per cent required ongoing monitoring of indoor air quality, 39 per cent required installation of basement ventilation, and 6 per cent required temporary evacuation until basement ventilation could be established. At the time, Northstar took a range of steps to reduce TCE concentrations in the indoor air of individual homes, including installing soil vapour extraction units, heat recovery ventilator systems and photo-catalytic oxidation units.

Remediation of TCE in groundwater is expected to take up to ten years, potentially resulting in long-term impacts on property values.

In 2009, there was negotiation of a settlement agreement. The settlement took the form of a series of funds set up for class members. Specifically, a property damages fund and extraordinary damages fund were set up for the class members. The property damages fund is distributed to members on a pro-rata basis. The extraordinary damage fund compensates members for damages not covered by the damages fund.

Northstar paid $1 million into the property damage fund and another $3 million was paid by promissory note. Northstar contributed $500,000 to the extraordinary damages fund and $550,000 towards the legal costs of class members. The settlement did not affect any personal injury claims, remediation required by the MOE, or Northstar's payment to members for increased charges on their hydro bills.

Conclusion

There is limited consistency in how vapour intrusion is regulated. Generally, federal and provincial governments have opted to focus on guidance rather than implementing laws. Much focus has been on streamlining what we know about vapour intrusion into concise guidance documents. Authorities are also trying to achieve consistency and uniformity in sampling methods and mitigative approaches.

Courts are grappling with the nexus (causal connection) and evidentiary burden of vapour intrusion claims. Most recently, the Courts have dealt with motions brought by defendants seeking the dismissal of vapour intrusion lawsuits.

In the future, there will be greater focus on vapour intrusion and the re-opening of previously assessed contaminated sites, where vapour intrusion was not then known to be a concern.

Marc McAree is a partner at Willms & Shier Environmental Lawyers LLP. Luciella Longo and Mark Youden were students at Willms & Shier.

For more information,
E-mail: jhardacre@willmsshier.com