The Environmental Corner

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Vapor Intrusion and Indoor Air Sampling Expensive Testing… Make Sure It's Done Correctly

Vapor Intrusion, or VI, is probably the hottest topic among regulators these days. Vapor intrusion may be best described as the contamination of indoor breathing air as a result of being in proximity to soil or groundwater releases of hazardous chemicals. Generally speaking, volatile organic compounds that have been released or spilled into the subsurface display a preference to evaporate into air spaces, or voids, in the soils. These vapors can then disperse and travel through the soils to nearby buildings. Contaminated soil vapors are most likely to travel along utility corridors where backfill material, such as sand, typically has more air spaces than the surrounding soils that were laid down naturally by Mother Nature. Once the vapors travel through a utility corridor, they may migrate into the building through concrete block basement walls, floor drains, drainage sumps or cracks in the floor.

Environmental regulatory agencies are taking proactive steps to evaluate whether vapors are entering residential dwellings in the near vicinity of dry cleaners. Additionally, new due diligence evaluations associated with refinancing properties and businesses or selling businesses or properties are calling for a determination of vapor intrusion on the subject properties. While the enforcement levels of organic vapors in buildings varies from state to state, the established levels deemed protective of human health, are extremely low. In a nut-shell, the approach is to determine whether a resident or worker that may be exposed to levels of organic vapors has a greater risk of getting cancer than the general population. It is a standard assumption by regulators and toxicologists that if a person has a greater chance than 1 in 1,000,000 people of getting

Continued on page 2

As Seen In…

Cleaner & Launderer

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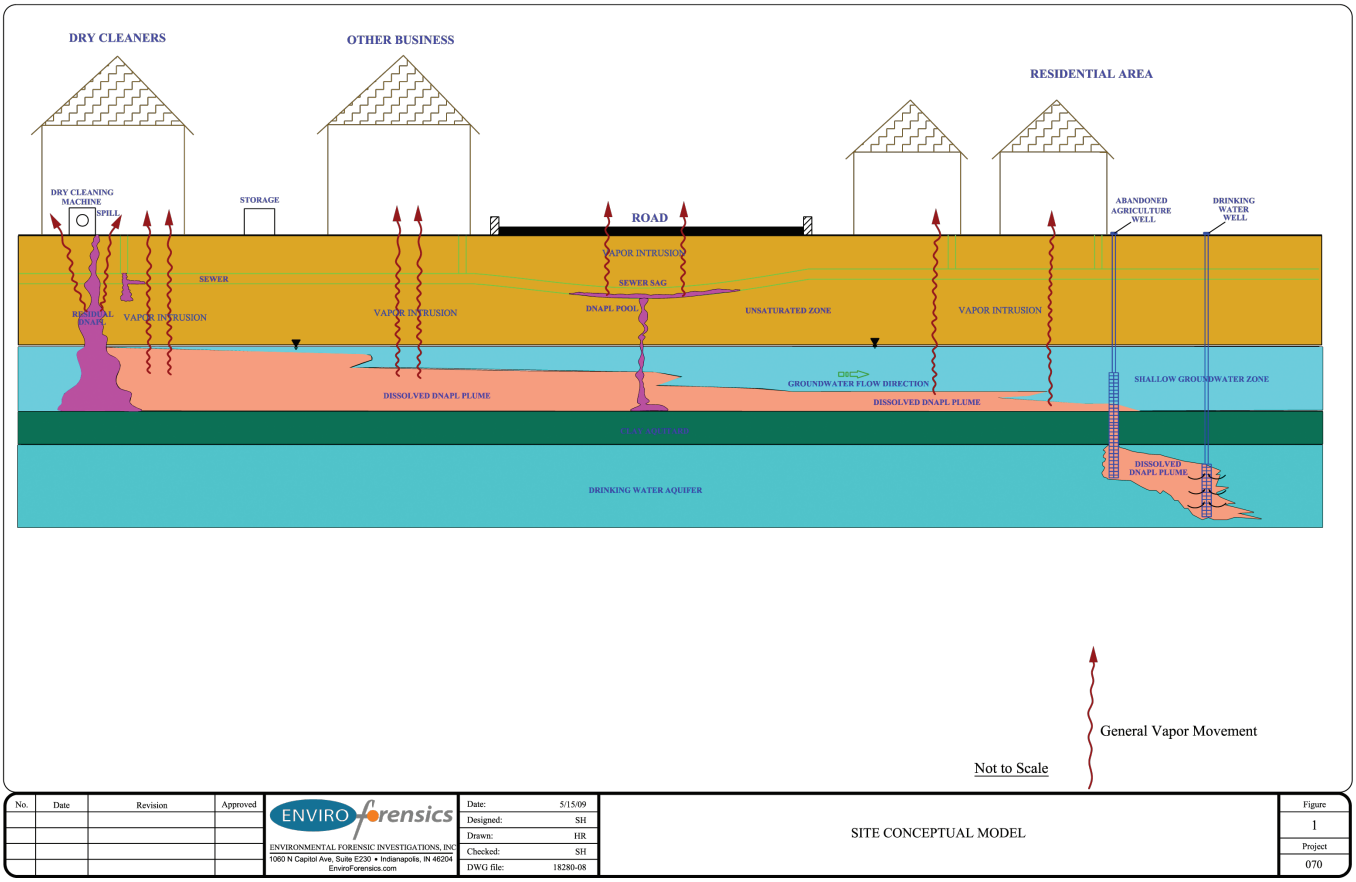

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SITE CONCEPTUAL MODEL

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cancer from organic vapors, a health risk exists. The severity of this risk is established by determining how much exposure an individual may receive based upon the amount of time that person may be in contact with the contaminated air. For houses or residences with contaminated breathing air, the amount of exposure is expected to be the highest since it is assumed that its occupants are exposed 365 days a year for the length of time they live there. For a worker in a commercial building with contaminated air, the amount of exposure is less since by national central tendency a worker works 8 hours per day, 219 days per year. Standardized input parameters are very conservative in order to safely account for people that may exceed the average exposure assumptions.

Since enforcement levels are so low, tremendous care must be taken when collecting samples of air to determine the concentration of harmful vapors in occupied spaces or the subsurface near a building. Once information has been collected that demonstrates an increased health risk to building occupants, a whole new front of investigation and cleanup will be opened. It is a good idea to develop a work plan prior to collecting the samples. If practical, make sure your work plan is approved by the regulatory agency before starting the work. The sampling protocol should follow the guidance documents that are developed by the regulatory agencies. Most states have modified the US EPA's proposed sampling methodology with minor variations. If your state does not have a guidance document for vapor sampling, make sure the US EPA guidance methods are followed.

Your work plan should include conducting a pre-sampling audit of the space. A check list should be filled out by your environmental professional (see the EnviroForensics web site for an example checklist) that identifies and inventories prod-

Continued on page 3

ucts that may contain chemicals that could skew the vapor results. Examples could include spotting agents, shoe polish, household cleaning products, oily rags, gas cans, and parts cleaning solutions. To the extent practical, these products and items should be collected and taken outside of the building being tested. Then, the windows and doors should be opened for at least 20 to 30 minutes to flush out the stagnant air that may hold organic chemicals. The windows and doors should then typically be closed for a period of 24 hours prior to testing to restore the potential connection between the subsurface and the indoor air, but the guidance documents vary from state to state.

In most developed areas the outdoor air that we all breathe contains low levels of many volatile chemicals. In an effort to determine the "background" air quality conditions, collecting an outside sample should also be part of your work plan. This sample is usually collected outside and upwind of the building being tested. Determining the upwind direction can be difficult, but nonetheless should be attempted as it will assist in determining whether outside air quality conditions may be affecting the indoor air sample results.

It is recommended that your work plan only include laboratory analysis for the chemicals detected in the soil and groundwater contamination near the building. This will limit any confusion related to indoor activities not related to the subsurface impacts. For example, identifying benzene (a chemical constituent commonly found in gasoline and cigarette smoke) in an indoor air sample does not assist in the evaluation of potential vapor intrusion from a subsurface spill of PERC dry cleaning solvent, which does not contain benzene. It is likely that once the benzene was identified, however, the investigation could become unnecessarily complicated from a regulatory position.

Finally, the environmental laboratory being used to analyze the air samples must be evaluated closely prior to including them in the work plan. Since more and more analytical labs are getting into the air analysis business to meet the rising demands of this new regulatory focus, there are many that are not truly qualified to analyze this difficult medium. No one can fault a lab for diversifying their business toward a new line, but because the analysis is considerably expensive (up to $250 per sample plus equipment charges), care must be made in selecting a qualified lab. I've seen situations where laboratory supplied sample containers were not properly cleaned prior to being issued to the samplers. Experienced and reputable air laboratories will provide certified proof that each container is "clean" and free of chemical contaminants prior to issuance. Obtaining a duplicate air or vapor sample at one location during your assessment will add another level of confidence to the results you are provided. During duplicate sample collection, two samples are collected side-by-side at the same time. One sample will be labeled with information pertaining to its location and sampling specifics, while the other will be submitted to the laboratory "blind" to provide a means of spot-checking the accuracy of the laboratory. Your work plan should include a protocol for these Quality Assurance and Quality Control (QA/QC) measures.

In summary, vapor intrusion is the hottest new focus in the environmental arena. A higher amount of grant monies and financial resources by states are being earmarked for evaluating indoor air at homes and businesses near contaminated sites, although the party responsible for the spill is likely also financially responsible for the vapor intrusion sampling. Sampling is expensive, but the ramification of having bad data that is not truly representative of vapors emanating from a groundwater plume or soil source, has a much greater consequence. Collecting good quality data is critical and can be accomplished if your consultant is following the proper procedures. Don't go cheap when it comes to collecting vapor samples. Make sure your consultant is experienced, that your work plan is approved (if practical), and that the analytical laboratory provides useful data.