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## VAPOR INTRUSION: A COMPLETED PATHWAY THAT DESERVES A PRECAUTIONARY APPROACH

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The surfacing of toxic vapor into our communities is one of the nation's most significant emerging environmental health issues. The New York State Department of Environmental Conservation and the New York State Department of Health should be praised for their pioneering efforts in this area. However, because vapor intrusion, where it occurs, is a completed pathway, there is a need to establish a more rigorous, comprehensive, precautionary response.

My name is Lenny Siegel. As Executive Director of the Center for Public Environmental Oversight, I work with community groups across the nation on vapor intrusion and other environmental health threats. As a resident of Mountain View, California, site of at least four ongoing vapor intrusion investigations, I have taken a crash course on the issue over the past two years.

Here is some of what I have learned.

### **Don't treat people like guinea pigs.**

People who live and work above soil and water contaminated with trichloroethylene (TCE), perchloroethylene (PCE), and other hazardous volatile chemicals are continuously exposed. It appears, at most of these sites, that the exposures have been occurring for decades. While it is usually possible to replace contaminated drinking water with water from alternate sources, it's much harder to replace the air we breathe.

TCE, once the universal solvent, is found in at least 852 of U.S. EPA's nearly 1,500 "Superfund" National Priorities List sites and thousands of other properties. Liquid TCE sinks and spreads within ground and surface water, yet the chemical also vaporizes and rises to the surface. Many TCE plumes in groundwater are several miles long. Though not found in nature, "background" levels of TCE are detectable in many urban airsheds.

In August 2001, EPA released a draft toxicity assessment for TCE. In summary, it found that children were more susceptible to TCE exposure than adults, and that TCE was five to sixty-

five times more toxic than previously believed. EPA's Science Advisory Board peer review praised the "groundbreaking" assessment, finding:

The Board advises the Agency to move ahead to revise and complete this important assessment. The assessment addresses a chemical, trichloroethylene (TCE), significant for being a nearly ubiquitous environmental contaminant in both air and water, being a common contaminant at Superfund sites, and because it is "listed" in many Federal statutes and regulations. The draft assessment is also important because it sets new precedents for risk assessment at EPA. We believe the draft assessment is a good starting point for completing the risk assessment of TCE. The Panel commends the Agency for its effort and advises it to proceed to revise and finalize the draft assessment as quickly as it can address the advice provided in this report. (See <http://www.epa.gov/sab/pdf/ehc03002.pdf>)

Based upon the draft assessment, most EPA regions have adopted a new "provisional" air screening level for residential or unrestricted exposure scenarios, corresponding to one excess lifetime (30-year) cancer among a million people, of .017 micrograms per cubic meter. This is known in EPA's Region 9 as the provisional preliminary remediation goal for residential or unrestricted scenarios. Though this low number cannot currently be used as the basis for enforcement orders, it still guides investigations in my California community.

However, responsible parties—the original polluters or their corporate descendants—are challenging EPA's draft toxicity assessment and the resulting lower health standards. In particular, the Defense Departments, which may face additional cleanup costs of hundreds of millions or even billions of dollars if the new risk findings hold, has elevated the question within the executive branch. The question of whether published studies really show that TCE is more harmful to children and other sensitive populations has been sent to the National Academy of Sciences for re-review, and U.S. EPA will not promulgate a new standard for years, if ever.

To my knowledge, while aggressively responding to high levels of TCE in indoor air—above 5 micrograms per cubic meter—New York has no clear plan for when and how to respond at lower concentrations. It has not made a clear case for an action level well above what we're using in Region 9.

I am not a toxicologist, and I recognize that reputable toxicologists argue about the level of risk that TCE poses to people who are exposed. However, I think it is important that policy-makers take a protective, or precautionary approach. That is, those people from TCE-impacted communities should not be treated as lab animals while we all await the results of the scientific debate. The Region 9 provisional standard was not pulled out of the air. It's based upon sound, peer-reviewed science, and that should be good enough to guide vapor intrusion investigations at this time.

### **Consider all sources, pathways, and receptors.**

Vapor intrusion is usually viewed as the spread of toxic fumes from underlying groundwater or soil directly into people's homes or other structures. That is often the most acute problem, but the risks are much broader. There may be chemicals in the air from other sources. Even though those pollutants may be subject to the authority of other agencies, the public should be made aware of those risks, and those agencies should be brought into the investigations.

More important, contamination from major groundwater plumes may escape over a large area, elevating ambient concentrations above the screening level. In my community, TCE was found in outdoor air at a local elementary school—sampled originally as a reference location. Some responsible parties call this a "background" level, as if TCE were a naturally occurring substance. I

believe, however, that neighborhood-wide toxic clouds, which vary with atmospheric conditions, are still the responsibility of the polluters. The contamination levels outdoors are generally lower than indoor contamination where there is a direct pathway, but larger numbers of people may be exposed.

To properly assess the human health risk, therefore, investigations should be based upon conceptual site models that consider all sources, pathways, and receptors. This means sampling to identify outdoor toxic clouds, and correlating those measurements with meteorological data. It means that venting and unscrubbed air-stripping, both of which simply move contamination into the air, should not necessarily be viewed as long-term solutions.

Furthermore, in deciding which areas to investigate—such as at which homes to sample indoor air or soil gas—it's important again to take a precautionary approach. The science for estimating indoor air pollution is still immature. I doesn't account for preferential pathways. It doesn't account for uncertainty in the horizontal extent in contamination. In Mountain View, both factors have emerged.

### **Remediate. Don't just mitigate.**

The presence of toxic vapors in people's homes, other structures, and the outdoor air is both a problem in itself and a sign of broader challenges. It makes sense, as New York has done, to act quickly to reduce the worst exposures. But it's also essential to deal with the long-term problem as well, for at least three reasons:

First, it is difficult to ensure that mitigation measures will remain effective in the long run.

Second, without the accelerated remediation of shallow groundwater or soil, there is no timely way to reduce outdoor exposures.

And third, it is difficult to redevelop or otherwise reuse vapor-impacted properties, and in most local economies current, innocent owners of such property may experience lowered property values. The cause isn't publicity or even the identification of the sites by regulatory agencies; it's the contamination itself.

Groundwater extraction systems—known as pump-and-treat—may have been the only remediation game in town five years ago, but now there are numerous alternatives that can protect more quickly against vapor intrusion, restore groundwater resources, and actually reduce the life-cycle costs of remediation.

New York State officials have told me that they agree that additional or more rapid cleanup is the logical response to vapor intrusion. Since, in promoting this approach, they may be going up against powerful economic and political forces, they need all the political help they can get.

### **I propose the following.**

1. That environmental regulators use .017 micrograms per cubic meter—as a screening level in their investigations. Laboratory analysis should strive for this detection limit. Exposures at this level should be measured. Sources of such exposures should be identified. Additional or accelerated remediation should be evaluated wherever ambient—that is, outdoor—sampling finds repeated readings above the screening level.
2. Soil and groundwater cleanup goals should consider more than the ingestion pathway—that is, drinking water and eating soil. They should also be strong enough to protect the air.

3. Mitigation—such as sub-slab depressurization systems—should be considered wherever sampling shows TCE exposures above .17 micrograms per cubic meter, ten times the screening level.
4. Development proposals at potential vapor intrusion sites should be denied wherever soil gas studies suggest that indoor air concentrations, after construction, may exceed the screening level. Housing and other sensitive uses should only be approved where A) it does not interfere with accelerated remediation, B) construction measures, such as impermeable slabs, are used to prevent vapor intrusion, C) lasting institutional controls can be imposed to ensure long-term monitoring as well as the implementation of contingency plans should engineering controls fail, and D) prospective buyers, renters, and other users of the property are warned of potential risks in time to make informed decisions.
5. The cleanup remedy decision should be re-opened—that is, reconsidered—at any site where vapor intrusion is recognized after the remedy selection process has been completed. At many sites, such as the sites in my community, the remedies are generally protective of our drinking water resources. But when those plans were adopted, there was no recognition of the vapor intrusion pathway.

Across the United States, environmental and health agencies, as well as scientists from government, academia, and industry, are working hard to understand both the mechanisms of vapor intrusion and the toxicity of the most common contaminants. Each new vapor intrusion site isn't just a mitigation or cleanup project. It's a research site. That's OK in itself, as long as policy-makers make it clear that protecting public health, with a clear margin of safety, is the primary goal. New York, as one of the first states to take on the vapor intrusion challenge, has the opportunity to set a positive, protective precedent.