

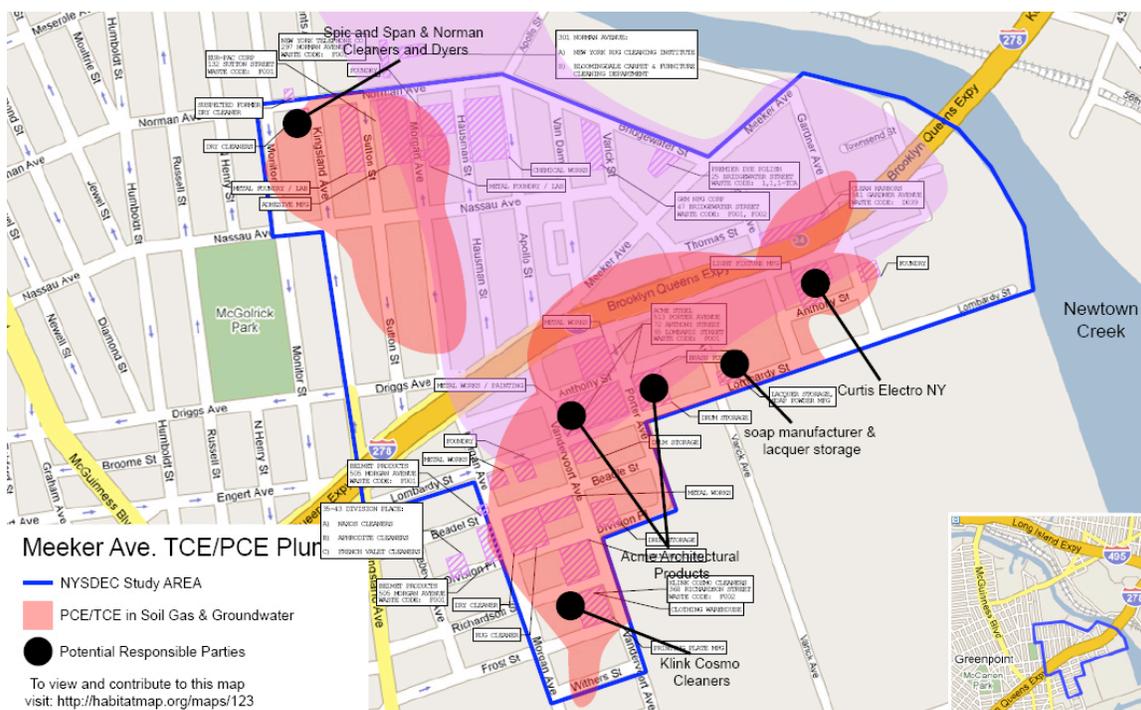
Vapor Intrusion in New York City Greenpoint: The Tip of the Iceberg

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For years New York State's environmental agencies have been conducting high-profile vapor intrusion responses upstate, but little has been reported about vapor intrusion in New York City, where about 42 percent of the state's population lives. However, the state's two-year-old investigation in Brooklyn's Greenpoint district suggests that there are *few* vapor intrusion sites in the City only because no one has looked.

The state's pro-active vapor intrusion strategy is centered around the Department of Environmental Conservation's (DEC) re-investigation of 421 "Inactive Hazardous Waste Sites With Pre-2003 Remedial Decisions Where Disposal of Chlorinated Hydrocarbons Occurred." The *New York Times* reports that only 14 of those sites are in New York City. Of the 421, at least 29 have shown indoor air contamination, and only two of those are in the New York City, in Queens.

In New York, as across the country, sites with potential vapor intrusion are usually identified by the presence of volatile organic compounds (VOCs) in shallow groundwater. At sites that rely upon wells for either public or private water supplies, there has been a reason to test the water for common contaminants such as



Map of Greenpoint VOC plumes courtesy of HabitatMap.org

trichloroethylene (TCE) and tetrachloroethylene (PCE). But New York City's water is imported from far upstate, so TCE, PCE, and other VOC plumes are discovered only by accident.

In my evaluations of exposure pathways at schools in the Bronx, Queens, and Manhattan, I have always found the presence of one of these chemicals, from an unknown nearby source. The schools' occupants are currently safe, but the concentrations of subsurface contaminants call for both mitigation and remediation.

Greenpoint is the site of a massive oil spill, estimated to total 17 million gallons soon after it was discovered in Newtown Creek—the waterway that separates Brooklyn from Queens—by the Coast Guard in 1978. In 2005, consultants for Exxon Mobil found TCE and PCE in soil gas near the edge of the fuel-spill plume. Also that year, consultants for the New York Department of Transportation found PCE in groundwater and soil as they studied the rehabilitation or replacement of the Kosciuszko Bridge, which carries the Brooklyn-Queens Expressway (BQE, or I-278) across Newtown Creek.

These findings triggered the “Meeker Avenue Plume Trackdown” investigation, covering 165 acres and 450 homes, according to the *New York Daily News*. DEC and the New York State Department of Health have conducted four sampling rounds of air, soil gas, groundwater, and soil in the area since 2007. A fifth round is underway this heating season. The purpose of the investigation is to identify the sources of the chlorinated VOCs, as well as to identify homes with indoor air pollution as a result of vapor intrusion from the plumes. There are actually two plume areas, both of which contain both TCE and PCE: along and south of the BQE and just east of McGolrick Park. Meeker Avenue is just one of the streets in the area, and it's not clear why the agencies chose that street as the name of their effort. In fact, community members think the project should be renamed.

The agencies identified multiple existing and former businesses that may have contributed to the plumes. In January 2009 DEC named three of those businesses—a metal products firm and two dry cleaners—to the State Superfund list. Even if some of those businesses are unable to pay for cleanup, this means that that it will be easier for the agencies to devote resources to investigation and cleanup. It's much more difficult for them to sponsor “trackdown” projects that are not associated with specific sources of pollution.

In October 2008 the agencies reported:

To date, a total of ninety-two (92) soil borings, thirty-five (35) temporary groundwater points, sixty-three (63) soil gas wells, and fifty-seven (57) groundwater monitoring wells have been installed and sampled by the NYSDEC. In addition, eighteen (18) residences participated in sub-slab/indoor air sampling.

In addition, ambient air sampling was conducted to determine whether elevated VOC levels indoors were simply flowing in from impacted outdoor air.



A residential street in Greenpoint, Brooklyn, New York

Initially, activists complained that testing found a *need for mitigation* (sub-slab depressurization systems, originally designed to prevent radon intrusion) in ten homes, but that DEC offered to pay for only two. However, state officials say that now that there are listed State Superfund sites in the neighborhood, other impacted homes will be eligible for state-funded systems.

With that problem apparently resolved, there are two issues that may be hampering an otherwise robust investigation. First, the *Times* reports that many residents have not allowed sampling teams into their homes:

In Greenpoint, as elsewhere, many homeowners—worried about a blow to their property values or even being forced from their homes [through condemnation]—have ignored letters asking for access to their buildings, or have refused to answer the door for investigators.

Activists say that recent immigrants in particular need re-assurances that they will not be harmed by the investigation if they are to cooperate. The area's two, three, and four-story residential buildings have a high concentration of recent immigrants from Poland and Latin America.



An industrial street in Greenpoint

Second, the need for mitigation is determined by comparing sublab soil gas and indoor air samples against the numbers in two matrices from the DOH vapor intrusion guidance. Relying on two separate metrics, the matrices are complicated. But they make sense. On the one hand, they allow for mitigation based upon high concentrations of VOCs in the sublab soil gas, even if there is no current pathway into the home. On the other hand, they discourage mitigation where it would do no good because the source of indoor contamination is not directly underneath.

The problem is not the matrices, but the comparison values built into them. New York's TCE matrix is slightly less protective than the action levels used by a number of EPA regions and states with active vapor intrusion programs. But its PCE matrix is off the charts, with a default action level of 100 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). This compares with an EPA Regional Screening Level (RSL), associated with a one in a million excess lifetime cancer risk, of $.41 \mu\text{g}/\text{m}^3$. If EPA's 2008 Toxicity Assessment for PCE is finalized, that number could fall to $.1 \mu\text{g}/\text{m}^3$. If the action level were based on EPA's numbers, the effective threshold would be "background," the level of PCE in the outdoor air, because it is impossible to use sublab depressurization to lower indoor air levels below outdoor levels. The outdoor contaminants would simply spread into the houses. I believe that New York's unprotective PCE matrix is based upon political and socio-economic concerns about the dry-cleaning industry, not public health.

Sampling results from one home, about a block from the dry-cleaner considered a source of the northern plume, illustrate the problem. Testing found $77 \mu\text{g}/\text{m}^3$ of PCE in sublab soil gas, $1.6 \mu\text{g}/\text{m}^3$ in basement air, and $.62 \mu\text{g}/\text{m}^3$ in ambient air. (To its credit, the state now considers basement air representative of potential conditions inside an entire residential building.) Under DOH's Matrix 2 for PCE, no further action is

necessary. However, if EPA's RSLs were used, or even if action were based on DOH's Matrix 1 (for TCE), mitigation would be required. (Nevertheless, mitigation is probably recommended for that building, because the TCE level in the slab soil gas was reported at $250 \mu\text{g}/\text{m}^3$.)

Officials respond to criticism by pointing out that the matrices are flexible guidelines, subject to interpretation, and that's how area activists are treating them. They are asking that all homes above the VOC plumes be mitigated. Indeed, New York is known for applying this "blanket" approach at other vapor intrusion sites, such as in upstate Endicott.

The Greenpoint area is particularly susceptible to toxic exposure because it hosts a mix of industrial and residential uses. The land adjacent to Newtown Creek constitutes the largest contiguous industrially zoned area in New York City. In addition to the oil refinery and storage facilities that caused the giant oil spill, there are hundreds of brownfields, 15 State Superfund sites, 19 waste transfer stations, the largest sewage treatment facility in New York City, and 19 registered point source air emissions facilities within one mile of the Creek.



The outfield sign at the Greenpoint Little League field highlights the property's past as a manufactured gas plant, with current gas storage in the background

Despite the area's environmental condition, there is a steady trickle of new developments in the area, with about a dozen new or under-construction structures, primarily four-story residential buildings, directly above the VOC plumes. Over the last half century, the boundaries between residentially zoned areas and industrially zoned areas around the Creek have grown increasingly blurry as manufacturing enterprises have

left and housing has moved in. The pace of this trend has accelerated in the last decade as rising real estate values in Manhattan have brought an influx of new residents, many of whom find affordable housing in illegally converted industrial buildings.

Protecting the residents of the area seems daunting, but with growing public involvement and media attention, it is likely that the residents of Greenpoint will get the mitigation and even the remediation necessary to protect their health. The agencies seem willing to enhance their outreach, and that in turn should lead to more action.

The primary lesson of the Greenpoint plume investigation, however, is that neighborhoods throughout the City may be susceptible to vapor intrusion from unknown VOC plumes. While oil refineries and sewage plants are not spread throughout the boroughs, dry cleaners and other small industrial facilities are. Unfortunately, systematic investigations to identify scattered groundwater contamination would be expensive, and addressing it—through both vapor intrusion mitigation and remediation—would be prohibitive. Yet thousands—maybe hundreds of thousands—may be breathing unsafe levels of VOCs in their homes and businesses every day. Even occupants of high-rise structures are at risk, because elevators may act as pumps, actually drawing subsurface soil gas to upper floors.

I suggest, therefore, a systematic reactive program. Each redevelopment project in New York City, whether large or small, industrial, commercial, residential or even recreational, should be required to conduct groundwater and shallow soil-gas sampling to begin to map VOC plumes throughout the City. And each new building should be built with subslab depressurization systems and vapor barriers that not only line slabs, but also seal basement walls, elevator shafts, and utility tunnels. In New York's vertical environment, the percentage increased cost of construction should be rather low. (In some instances, other mitigation technologies or building design may substitute for the standard forms of mitigation.)

Finally, the City should institute a program where prospective homebuyers, as part of the home inspection process, can for a small fee have indoor air testing conducted in the residential unit they are considering. Once such a program gets off the ground, similar services might be made available to other property-owners and renters. Gradually, sampling data will lead to a better understanding of vapor intrusion city-wide and allow those families that are most concerned to avoid exposures.

One can speculate, based upon the limited data available, how great the vapor intrusion risk is in New York City. To be sure it's not the only environment risk. But the only way to identify exposures, pathways, and sources is to undertake a reasonable city-wide sampling strategy.