Vapor Intrusion at the Old and New Bronx New School Campuses

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In August 2011 the New York City Department of Education (DOE) announced that it was relocating the Bronx New School elementary school, also known as PS 51x, from its two-decade home in a leased former factory building at 3200 Jerome Avenue in the northern Bronx to a closed Catholic School two miles away. It explained that sampling conducted earlier in the year had found indoor trichloroethylene (TCE) concentrations ten times New York State Department of Health's (DOH's) exposure standard. Because students and teachers had been exposed to this cancer-causing chemical for months after the initial test results—and probably for years—the announcement ignited a political firestorm. Then indoor testing at the new campus showed tetrachloroethylene (PCE) levels above both EPA guidelines and ambient (outdoor) air. Based upon DOH's outdated, unprotective PCE standard, DOE declared the new New School safe, and despite requests from parents it has announced no plans to conduct another round of sampling in the heating season, as required by DOH guidance.

Entrance to former school at 3200 Jerome Ave.

DOE Chancellor Dennis Walcott apologized at a public meeting for the delayed release of information, and DOE says it has conducted indoor air quality testing at its other leased

campuses, but the Department has not agreed to conduct full-fledged environmental reviews at new leased schools, even if they are proposed for former industrial buildings. However, PS 51x parents—past and present—and the teachers' union are dissatisfied with DOE's response, and they are working with other groups in the City to make fundamental changes in environmental policies of both DOE and its companion agency, the New York City School Construction Authority (SCA).

Site History

From 1993 through June of 2011, New York City leased a triangular, two-story, 18,200 square foot building at the corner of Jerome and Van Cortlandt Avenues in the northwest Bronx for the Bronx New School. Apartments abut the building on the east. Above Jerome Avenue is the #4 train, the elevated extension of the Lexington Avenue subway. There are a number of nearby industrial uses, including auto repair shops, a petroleum bulk storage facility and gas station, a New York City Department of Environmental Protection maintenance facility, and an elevator repair company.

The property itself was used for automotive repair in the 1940s. The current structure was built about 1954, and from 1957 to 1991 it hosted manufacturing. At least from 1976 the same building served as a factory for Nessen Lamps, which according to the New York State Department of Environmental Conservation (DEC) used TCE in manufacturing. Despite that history, the SCA leased the property in 1993 without conducting environmental tests.

View of 3200 Jerome Avenue from the #4 Train

This was no accident. Since at least 1994, when school authorities defended themselves before the state Supreme Court, they have asserted that New York's environmental review requirements do not apply to City schools sites "procured through negotiated leases." In 2010, in opposing legislation designed to confirm that review requirement, the Department of Education argued, "If the SCA cannot enter into leases on a commercially reasonable basis and schedule, the leasing program would cease to be a viable approach for the creation of new school seats."

Jerome Avenue Side of old New School

Since 2003, however, SCA and DOE have conducted confidential Phase I Environmental Site Assessments upon the renewal of school leases. At PS 51x, AKRF Engineering completed an Environmental Site Assessment in January 2011, identifying both on-site and off-site Recognized Environmental Conditions. AKRF recommended indoor air quality testing, and it conducted four rounds of air and soil gas sampling in January, March, April, and May. AKRF's Phase I and indoor air reports appear to have been conducted professionally according to ASTM (the organization that defines Phase I procedures) and DOH standards.

TCE Is Found

AKRF found serious problems, particularly with TCE. In the soil gas beneath the school, it found TCE concentrations as high as 53,300 micrograms per cubic meter ($\mu g/m^3$).[1] DOH requires mitigation (see below) wherever subslab TCE vapor levels exceed 250 $\mu g/m^3$, even in the absence of unacceptable levels indoors. In the basement boiler room it found TCE as high as 607 $\mu g/m^3$, and in the first floor cafeteria and hallway it found TCE as high as 53 and 49 $\mu g/m^3$,

[1] Though the ratio may vary, soil gas levels beneath buildings are typically 1000 times the concentration found in indoor air.

respectively. DOH's indoor air guideline is 5 $\mu g/m^3$. U.S. EPA's new indoor air guideline for TCE is about one tenth of that.

Without a doubt, students and staff were exposed to levels of TCE believed to unacceptably increase the chronic health risk. While it is remotely possible that the contamination flowed under the school more recently from an off-site source, the best explanation today of the high levels of TCE in the soil gas is that Nessen Lamps released the chemicals during its operations and that the contamination has been under and inside the school throughout its entire 18-year lifetime.

In October, DEC announced that the site owner, under DEC supervision, would soon begin a Preliminary Environmental Assessment that will include groundwater sampling. This sampling should determine more reliably whether the contamination originated on site. Indeed, the sampling may not only show that school occupants were exposed to airborne TCE throughout the life of the school. It may suggest that they were exposed to higher average levels.[2]

On Friday night, May 13, 2011 AKRF ventilated the building by opening windows overnight and operating a roof fan. On Saturday, May 14 it sampled the indoor air. On the first floor it found TCE levels of 2.4 and 1.7 $\mu g/m^3$, and in the partial basement it found a very high concentration of about 600 $\mu g/m^3$.

After its May 13 ventilation, AKRF made three key recommendations:

1. "instruct the school's custodial staff to ventilate the building nightly until the regular school session ends in late June 2011. Overnight ventilation should consist of operating the building heating, ventilation, and air-conditioning (HVAC) systems in summer mode, activating the 8,000-CFM ventilation fan, and opening all windows in the first and second floor classrooms at the end of each school day…. In addition, the door at the top of the stairwell leading to the partial basement should remain closed throughout the school day."

2. "steps should be taken to further minimize vapor migration from the partial basement to the first floor. These steps should include installing weather stripping around the basement door; sealing any cracks, floor drains, or other openings in the basement floor; and sealing any openings between the basement and first floor. The basement should also be separately ventilated…"

3. "As a long-term remedial measure, AKRF recommends retrofitting the existing building with an active sub-slab depressurization system (SSDS) prior to the school re-opening in September 2011."

Sub-slab depressurization, derived from radon control, is a proven, relatively inexpensive form of mitigation. Perforated pipes, often connected to a blower fan, reduce the pressure beneath the building, so if vapors pass between the subsurface and indoors, they move downward, thus eliminating vapor intrusion.

[2] Indoor air contamination from vapor intrusion varies over time. In New York, levels are usually highest during the heating season, when buildings are sealed and heating systems create a strong relative negative air pressure inside. That pressure differential sucks up vapor contaminants, not only from underneath the building, but from adjacent land.

CPEO-Led Workshop on Vapor Intrusion, September 2011

However, the report containing those recommendations, including the most immediate one—ventilation until the end of the school year—was not published until June 28, the day after the end of the school year. Furthermore, neither the school community (teachers, parents, etc.) nor elected officials were told anything about the contamination until August, when the Department of Education announced plans to move the school to a former Catholic School campus, St. Martin of Tours, two miles south. The Department of Education says it decided to move the campus because, it asserted, the long-term mitigation engineering controls could not be implemented before school began again after Labor Day. There is no indication that AKRF's interim recommendations were implemented during May or June, even though school authorities must have known about them.

Understandably, parents and teachers were upset. The news media quickly picked up the story. In an August 18 meeting with parents, Department of Education Chancellor Dennis Walcott apologized to parents, and he explained that the Department was reviewing its policies. The Bronx Borough President and six New York City Council members sent letters to Walcott calling for additional sampling city-wide and public disclosure of the results.

Health Concerns

Meanwhile PS 51x parents expressed concern that TCE exposure might have been the reason their children's health problems, such as headaches, dizziness, and nausea. Parents and teachers asked for health monitoring, even though it is difficult to associate health conditions with exposure because the direct traces of exposure—TCE in the body—quickly disappear.

On November 2, the New York *Daily News* published a story reporting "hundred of cases of sick students since 2005." It documented vomiting, heart palpitations, and abnormal gait. The *Daily News* wrote:

> "There was obviously something wrong in that building," said one veteran school nurse who reviewed the records. The alarming health problems persisted to the point that the building's nurse wrote to supervisors in November 2009 about "immunity issues" among students and "ongoing issues with the air-conditioning and heating system" in the school building, according to a source who saw the letter.

In the midst of the local debate over TCE exposure, U.S. EPA released a toxicity assessment for TCE for the first time establishing official toxicity factors for TCE in indoor air. EPA concluded that TCE causes cancer—including kidney and liver cancer—through both the ingestion and inhalation pathways, and it set a cancer slope factor that would place the one-in-a-million excess lifetime cancer risk level at about .5 $\mu g/m^3$. It set the non-cancer reference concentration at 2 $\mu g/m^3$, associated with conditions such as chronic neurological disease and fetal heart development.

EPA's findings highlight the imperative of reducing indoor air exposures to TCE and similar chemicals, and hopefully New York State DOH will quickly adjust its exposure standards accordingly. However, the known concentrations of TCE as PS 51x, even in light of EPA's assessment, do not explain the reported acute health problems at the old campus. I see four possible explanations:

1. Exposure levels have been higher than those identified thus far.

2. Acute health consequences of TCE exposure have not adequately been studied.

3. The reported health cases are within the normal range.

4. Poor ventilation was responsible for both elevated TCE levels and acute health effects, with another airborne substance being the direct cause.

Given the limited data that is available, I doubt that it's possible to explain acute health conditions that occurred in the past. Moreover, it's more important to ensure that students and staff are breathing clean air on their new campus.

Conditions at the New New School

Understandably, parents and staff had a number of questions about the suitability of the St. Martin buildings, including educational facilities, general maintenance, transportation, and indoor air. At the end of August, just before the start of school, the School Construction Authority released an Indoor Air Quality Survey for the new campus, at 695 E. 182nd Street. It asserted that the survey showed the campus to be safe.

New New School at 695 E. 182nd Street

I immediately reviewed the data and I sent my analysis to New York Lawyers for the Public Interest, with which I work on New York City school issues, to parents, and to teacher representatives. I concluded:

> *In my opinion, the sampling data do not demonstrate conclusively that risk from toxic exposure is at an acceptable level.* Based upon the tetrachloroethylene (PCE) standard used by other jurisdictions, the PCE found inside the school building may represent a slight increased risk of cancer after long-term exposure. Equally important, more investigation is necessary to determine the likelihood of *vapor intrusion* due to releases from a nearby former dry-cleaning business.

New York State DOH has set the air guidance value for PCE at 100 $\mu g/m^3$. Though the prevailing science considers PCE as toxic, or more toxic than TCE, PCE at the TCE concentration (53 $\mu g/m^3$) that caused DOE to close the Jerome Ave. site would trigger no response.

TRC Engineers, the School Construction Authority's contractor, found PCE at 1.2 $\mu g/m^3$ in the basement cafeteria, compared to .26 $\mu g/m^3$ in outdoor air at the site. While the Survey correctly reports that this level is far below 100 $\mu g/m^3$, it is well above the .41 $\mu g/m^3$ level used

by U.S. EPA in its Regional Screening Levels, and even further above the lower level (.1 µg/m^3) inferred from EPA's June, 2008 draft Toxicological Review. In a setting where students and staff are present forty hours or less each week, the comparable non-residential standard could be somewhere around 2 µg/m^3 or lower.

In December 2009, 30 organizations wrote the New York State Department of Health asking it to harmonize its standard with EPA's. Late that month, the Health Department's Dr. Howard Freed replied, committing the Department to revisiting the PCE value in 2010. That didn't happen. It is likely that New York officials are waiting for EPA to finalize its Review first.

In itself, the 1.2 µg/m^3 level is not a big deal. Much of New York City has that in outside air. When my colleague and I reviewed data from the Information Techology High School in Queens in October 2007 (see http://www.cpeo.org/pubs/InfoTech.pdf), we found that outdoor air was responsible for indoor air sampling results at that same level.

New New School 182nd Street Gym Building

However, at St. Martin/PS 51x the PCE reading may be the tip of the iceberg. The Indoor Air Quality Survey indicated the presence of a former dry cleaner at 2296 Crotona Ave., now a video store, several hundred feet from the new New School. Quite possibly, contamination from this site is responsible for the elevated levels of PCE at the school. While TCE, which is sometimes present as a breakdown product of PCE, is the contaminant of concern at the Jerome Ave. site, PCE is found much more widely in groundwater and probably indoor air throughout

New York City. In the past TCE was used widely in manufacturing, but PCE remains the compound of choice for dry-cleaning. And dry-cleaning operations, past and present, are found throughout New York City. Because groundwater is pumped and used in only a very small section of Queens, little has been done to find, let alone map, PCE groundwater plumes anywhere in the City.

The August 8, 2011 sampling of indoor air at the site may not have captured the full risk associated with vapor intrusion at the site. The New York State Department of Health's Vapor Intrusion Guidance recommends that sampling be conducted in the heating season, when the lower air pressure inside pulls up volatile contamination from below the building, and when less ventilation occurs. Because of the urgency of the situation, school authorities were right to conduct sampling in August, but it is possible that sampling during the winter will show higher levels of indoor contamination

Furthermore, there is a need to conduct soil gas testing under the school buildings. New York State Department of Health's guidance recommends action based upon high build-ups of toxic soil gas, even if indoor air levels are low. Soil gas sampling also would help determine whether the indoor air contamination is coming from below, or from another source.

At a public meeting on October 12, Chancellor Walcott claimed "that the PCE readings were insignificant and likely caused by an open container that was later removed from the building." That is possible, but all 13 chemical containers in the building were identified and enclosed prior to sampling. None of those described in detail in the Survey report contained PCE. More important, as far as I can tell no subsequent sampling was conducted to test the Chancellor's hypothesis.

I don't know whether the St. Martin campus is safe enough to operate as a school without mitigation, but I am deeply concerned that school authorities have re-assured parents, teachers, and public at large that the air is safe without conducting sufficient sampling and that they continue to hide behind DOH's outdated, unprotective PCE standard. In the wake of the failure to disclose the problems at the old PS 51x campus, official pronouncements can only produce mistrust.

District-Wide Policy

Following the 3200 Jerome Ave. disclosures, activists and City Council members sent a letter to the Department of Education on August 30 calling upon it to "Conduct immediate indoor air quality testing of all 31 existing leased school sites that have not undergone any environmental review to date," as well as public disclosure of the results. To overcome the Department's use of DOH's unprotective PCE standard, they suggested applying to PCE the DOH Matrix that sets the exposure standards for TCE. They also insisted that follow-up testing be conducted in the heating season. Finally, they demanded that DOE "disclose all documents relating to the environmental review, investigation, and remediation of the 65 school leases that have been renewed since 2002…"

In response, DOE reports that it has sampled indoor air at the 31 schools, and it has once

again assured the public that everything is OK. It says it plans to post the results on the SCA web site as soon as final reports are received. It also states that final reports on the other 65 leased schools are available upon request. Until the results are public, there is no way to know whether any of the PCE results exceeded EPA's screening level. Furthermore, there has been no promise to re-sample during the heating season, so vapor intrusion problems might be missed. More broadly, the school agencies have not put forward a comprehensive environmental review policy so that community groups, teachers, and elected official will know what to expect as more industrial properties are converted to school campuses.

The August 30 letter establishes a sensible plan for addressing schools that are already under lease, but it is more difficult to undertake sampling on properties that have not yet been leased. Property owners would have to give permission for such sampling, and many are likely refuse—to refuse to do business with the SCA—because the results might identify contamination requiring cleanup and at the same time leading the School Construction Authority to reject the site. Another strategy may be required for new leases.

There's a simple alternative, to protect the students and staff of New York City schools from vapor intrusion, the School Construction Authority and the Department of Education should establish a policy requiring newly leased schools, before occupancy, to be routinely equipped with passive or active subslab depressurization systems or other mitigation strategies recognized in the New York State Department of Health Vapor Intrusion Guidance. Reportedly, SCA already does this for schools on city-owned property.

There is a good chance, in any New York City neighborhood, that a site large enough to house a school either suffers from on-site PCE or TCE contamination or has a plume of contaminated groundwater flowing underneath. Should school authorities develop evidence, through sampling that includes soil gas testing, that vapor intrusion is unlikely, the mitigation requirement could be waived.

The advantage of this approach is that it gives property owners (for proposed leased schools) an incentive to cooperate. The decision to mitigate would not create a stigma, because it would be routine. Instead of creating a new liability, mitigation would add to the building's value. And in most cases the cost of mitigation is small compared to the overall cost of building or even converting a school building.

After installation, but before occupancy, indoor air testing would be used to determine the effectiveness of the system. If the system were originally installed as passive, elevated indoor air concentrations would trigger a decision to "go active": install and operate blower fans. Long-term management and monitoring plans would be developed based upon initial sampling. All installation and monitoring information would be provided proactively to the public through the schools' web sites.

The routine installation of mitigation system would have an additional benefit. These systems were initially designed to combat radon intrusion, and they provide protection anywhere indoor radon levels are above outdoor levels. Though there are some areas, such as parts of New Jersey with high levels of radon intrusion, where mitigation is required in new school (and

residential) construction, most jurisdictions do not mandate radon mitigation because radon is naturally occurring. Still, the (lung) cancer risks from typical radon intrusion are orders of magnitude above the risks associated with the action levels for TCE and PCE, so the health benefits would be significant.

The technology exists to protect New York City's students and teachers from subsurface contamination, but the official will seems to be missing—at least as leased sites. School authorities must recognize that healthy schools contribute to educational success. Sampling and mitigation for vapor intrusion (and radon intrusion) should be viewed as building-blocks, not impediments, to educational success. School authorities should share information with their communities, not withhold it, to build trust. And trust is the number one factor in promoting constructive relationships among communities, school agencies, responsible parties, property owners and developers, and regulatory agencies.