



**Independent Review of the
Cleanup of the Mott Haven Schools Complex
Bronx, New York**

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Overview of the Mott Haven school site, the Bronx, New York

The New York City School Construction Authority (SCA) plans to construct four schools on a 6.63-acre former railyard property in the Bronx known as the Mott Haven site, adjacent to two existing schools, P.S. 156 and I.S. 151. The 275,000-square-foot multi-story facility, with a footprint of 147,000 square feet, will serve more than 2,200 high school and middle school students. The primary entrances will be at street level from Concourse Village West, which is 30 feet above the former railyard property, supported by a retaining wall. Playing fields and other open space at the railyard elevation will cover the eastern portion of the campus.

Over the past several years, a series of environmental investigations have found a range of environmental contaminants on the property. These include semi-volatile organic compounds (SVOCs) from a former manufactured gas plant (MGP), BTEX (benzene, ethylbenzene, toluene, and xylene) from gasoline leaks and spills, and chlorinated solvents such as the dry-cleaning chemical, perchloroethylene (PCE, also known as tetrachloroethylene), and trichloroethylene (TCE).

In 2005, the Mott Haven site was accepted into New York's Brownfield Cleanup Program. SCA and its consultants, the Shaw Group, completed a Remedial Investigation in November 2005, and in 2005-2006 it submitted a Remedial Action Work Plan (with supplements) to state agencies. Both the New York state Department of Environmental Conservation (DEC) and Department of Health (DOH) have approved the SCA's remediation plan. In brief, it calls for the excavation and dewatering of soil from a 300-by-125-foot rectangle at the northwest corner of the site; the installation of hydraulic barriers (already completed) along the western and northern edge of the property; and the installation of vapor barriers and sub-slab depressurization systems under the new school buildings.

Much of the contamination at the Mott Haven site, as well as underneath the existing schools, appears to be migrating from the west. Accordingly, DEC has negotiated a Stipulation Agreement with a nearby property owner to address gasoline-related contaminants, and it plans to investigate and remediate the MGP wastes.

Site neighbors, including employees at the existing schools, have expressed concern about the construction of educational facilities on contaminated property, and they have organized the Bronx Committee for Toxic Free Schools. Furthermore, occupants of the existing schools reported health complaints that they associated with pre-construction activity at the Mott Haven site.

As a result, the Bronx Committee contacted the New York Lawyers for the Public Interest (NYLPI). In early November, 2006 NYLPI sent the SCA comments prepared by Allegiance Resources Corporation raising a number of questions about the planned remedial action. SCA responded two weeks later. NYLPI responded by pressing for an independent technical review. In December, 2006 SCA agreed to fund an independent review of the Mott Haven site with a consultant selected by NYLPI.

November 12, 2006, at the National Brownfields Conference in Boston, Lenny Siegel of the California-based Center for Public Environmental Oversight (CPEO) led a discussion on where, when, and how it is appropriate to build schools and other sensitive facilities on contaminated properties. An attorney from NYLPI attended that discussion. Subsequently, NYLPI contacted Siegel to discuss the investigation and work plan for Mott Haven. NYLPI asked CPEO about conducting an independent review, and on December 19 NYLPI (on behalf of the Bronx Committee) contracted with CPEO to carry out the SCA-funded independent review. CPEO subcontracted with Peter Strauss of PM Strauss & Associates to assist in the technical review.

CPEO began to review available documents immediately, and on January 2, 2007 Siegel traveled to New York for three days of meetings and two visits to the site. Though the New York City Council approved the Mott Haven project on January 9, 2007, prior to the completion of this report, in a letter to the Council that day, the SCA promised to develop a protective Site Management Plan and to evaluate and take under serious advisement this independent review.

CPEO finds that the investigation and remedial planning for the Mott Haven site has been conducted professionally, and furthermore, that the SCA has committed to spending substantial resources on remedial action. However, CPEO also believes that the commitment to long-term management of the site should be strengthened to protect better the health and well-being of schoolchildren and others who will be using the site. CPEO does not have enough information to determine whether health problems in the area might have resulted from site activity, or for that matter, from living near a former industrial area with a confluence of major thoroughfares.

The Mott Haven Site, together with property beneath the existing schools, formerly constituted the Mott Haven Yard, a railroad yard that operated from 1873 until 1946. Its lines fed north through the Bronx and to Upstate New York as well as New England, and south into Grand

Central Station. The yard consisted of a wide network of tracks, a carpenters shop, a machine shop, and storage facilities. It is likely that the machine shop used solvents such as TCE to clean engine parts and that the carpenters shop applied creosote to railroad ties as a preservative. Creosote oil often contains coal tars, usually containing naphthalene, anthracene and other substances that are found throughout the site.

The area where the schools will be built is surrounded by commercial and residential land uses. Many off-site spills and releases of hazardous substances have occurred in the immediate vicinity, and they are potential contributors to the contamination found on site. There are at least two dry cleaners about a city block away from the sites, and numerous facilities have used and stored petroleum products nearby. Fire insurance maps depict a former manufactured gas plant (MGP) to the northwest, and MGP wastes may have been spread over a wider area.

CONTAMINATION

The most significant contaminants of concern in the Mott Haven area may be divided into three categories: Semi-Volatile Organic Compounds (SVOCs), Gasoline-Related Contaminants, and Chlorinated Solvents.

Semi-Volatile Organic Compounds

The SVOCs found throughout the property appear to have been released through manufactured gas plant waste disposal, creosote application, and perhaps fuel oil spills in the area. In general these compounds are not very mobile. Most of the SVOCs found at the Mott Haven Site contain polynuclear aromatic hydrocarbons (PAH). These are of particular concern because many are suspected human carcinogens. For example, coal tars containing benzo(a)pyrene were linked to cancer by the early 1900s. For the most part, SVOCs found at the site exhibit low volatility, low solubility, a strong tendency to sorb to soils and sediments, and have low biodegradability. Thus, most tend to be relatively immobile and persistent in the environment. PAHs in general do not easily dissolve in water. SVOCs, as their name implies, are not very volatile, and most found at the site, unless exposed to high temperatures, do not present a serious vapor inhalation problem. Most SVOCs found at the site adhere to soil particles. Thus, there is a danger that during excavation or any routine disturbance of the soil, small particles could be inhaled.

As opposed to other SVOCs, naphthalene binds weakly to soils and sediment. It easily passes through sandy soils to reach underground water. When near the surface of the soil, it evaporates into air. It is now an EPA-suspected carcinogen, and it is known to cause blood related illnesses such as anemia, which is the primary health concern for humans exposed to naphthalene for either short or long periods of time.

SVOCs have been found in soil throughout most of the site, with depths varying from the surface down to 16 feet. Most borings indicated their presence in the three to six-foot range. However, many of the samples were only take at one depth, so it is not entirely clear how they are stratified. **Table 1** provides the highest detections of SVOCs found within the three distinct areas:

- The 300 by 125-foot excavation area (37,500 square feet)
- The remainder of the planned building footprint (approximately 110,000 square feet)
- Land outside the building footprint (about half of the land surface).

As can be seen from this Table, the highest concentrations of SVOCs lie outside of the school footprint area.

Table 1
Maximum Detections of Semi-Volatile Organic Compounds in Soil
Mott Haven School Construction Site

parts per billion (ppb)

Only detections above Recommended Soil Cleanup Objectives (RSCO)¹ are noted

Constituent	RSCO	Excavation Area	Remaining School Footprint	Remainder of Site
Benzo(a)anthracene	224	7,400	6,100	31,000
Benzo(a)pyrene	61	8,400	5,600	23,000
Chrysene	400	7,100	7,500	31,000
Benzo(k)fluoranthene	1,100	2,200	2,900	11,000
Indeno(123-cd)pyrene	3,200			7,900
Benzo(b)fluoranthene	1,100	6,600	8,800	34,000
Naphthalene	13,000	96,000 ²		
2-Methylnaphthalene	36,400	57,000		
Phenanthrene	50,000			65,000
Pyrene	50,000			63,000
Dibenzofuran	6,200	7,100		6,800
Fluoranthene	50,000			79,000
Dibenzo(a,h)anthracene	14	380	96	1,100

Many of the same SVOC contaminants, presumably from the same sources, have been found under the existing schools. For this reason, the School Construction Authority and its consultant, the Shaw Group, prepared a March 2006 Draft Work Plan for a Supplemental Remedial Area under P.S. 156. The Supplemental Remedial Area is a small, 50-by-60-foot rectangle underneath the southwestern corner of the existing school platform.

Most of the under-platform soil samples indicating SVOCs above Recommended Soil Cleanup Objectives (RSCOs) are under P.S. 156, although a few soil samples adjacent to or underneath I.S. 151 were found to exceed RSCOs. The contaminants are at varying depths,

¹The RSCOs referenced throughout this report are the standards listed in the Remedial Investigation Report and the Remedial Action Work Plan. However, the DEC has adopted new regulations for brownfield sites that established different cleanup objectives for SVOC contaminants and BTEX.

² In the testing for volatile organic compounds in soil, the results for naphthalene came in even higher, at 220,000 ppb.

ranging from 2 to 13 feet. Many of these contaminants lie within the remediation area. However, many of the samples were only taken at one depth, so it is not entirely clear how they are stratified. **Table 2** provides the highest detections of SVOCs found within both the remediation area and the remaining property. As can be seen from this Table, the highest concentrations of SVOCs lie inside the remediation area. The plume of naphthalene in groundwater is on the western side of the site, and much of it lies beneath the surface of the remediation zone.

Table 2
Maximum Detections of Semi-Volatile Organic Compounds in Soil
P.S. 156 and I.S. 151
 parts per billion

Only detections above Recommended Soil Cleanup Objectives (RSCO) are noted

Constituent	RSCO	Inside Remediation Area	Remainder of site
Benzo(a)anthracene	224	26,000	1,700
Benzo(a)pyrene	61	27,000	1,400
Chrysene	400	5,100	1,600
Benzo(k)fluoranthene	1,100	9,300	
Indeno(123-cd)pyrene	3,200	4,000	
Benzo(b)fluoranthene	1,100	22,000	1,600
Naphthalene	13,000	150,000	
2-Methylnaphthalene	36,400	66,000	
Phenanthrene	50,000	150,000	
Pyrene	50,000	69,000	
Dibenzo(a,h)anthracene	14	2,100	

Gasoline-Related Contaminants

Petroleum-related volatile organic compounds (VOCs), primarily benzene, toluene, ethylbenzene, and xylene (known as BTEX), are present at Mott Haven either as the result of nearby gasoline leaks and spills or possibly from the old manufactured gas plant operations. The BTEX compounds are not very persistent in the environment, as a “healthy” soil rich in microbes tends to break these chemicals down. On the other hand they are mobile in the environment, and they dissolve in water and easily pass through sandy soils. They are volatile, and vapors can diffuse from groundwater or soil to the air. Benzene is a known carcinogen and was linked definitively to leukemia in 1977. It is linked to other kinds of blood disorders, as well. Toluene may affect the nervous system. Low to moderate levels can cause tiredness, confusion, weakness, memory loss, nausea, and loss of appetite. High levels of toluene may affect kidney health. Symptoms usually disappear when exposure is stopped. There is limited information on the health effects of ethylbenzene and xylene. The available information shows dizziness, throat and eye irritation, and tightening of the chest of people exposed to high levels of ethylbenzene in air. High levels of xylene exposure for short or long periods can cause headaches, lack of muscle coordination, dizziness, confusion, and changes in balance.

Most of the BTEX soil contaminants that were found above soil cleanup objectives are located within the excavation area, in the groundwater or soil above the groundwater table. Most

are within the first 12 feet of soil. As can be seen in **Table 3**, all of the petroleum-related VOCs exceeding recommended soil cleanup objectives are within the excavation area. Similarly, the most significant contamination of the groundwater is in the northwest portion of the Mott Haven campus. In fact, the BTEX plume exceeding 1,000 parts per billion (ppb) underlies two-thirds of the excavation area, where depth to groundwater ranges from 5 to 10 feet, and the saturated zone is approximately 10 feet.

The Remedial Investigation also took soil gas samples underneath the excavation area. The highest readings were in the Northwest corner, with N-hexane, n-heptane, and cyclohexane (chemicals that are petroleum hydrocarbons, possibly related to gasoline) measuring the highest (up to 84,000 $\mu\text{g}/\text{m}^3$, 22,000 $\mu\text{g}/\text{m}^3$, and 9,300 $\mu\text{g}/\text{m}^3$ respectively). BTEX was detected in most samples, including 1,000 $\mu\text{g}/\text{m}^3$ at one location.

Table 3
Maximum Detections of BTEX in Soil
Mott Haven School Construction Site
parts per billion

Only detections above Recommended Soil Cleanup Objectives (RSCO) are noted

Constituent	RSCO	Excavation Area	Remaining School Footprint	Remainder of Site
Benzene	60	23,000		
Toluene	1,500	9,600		
Ethylbenzene	5,500	61,000		
Xylene	1,200	130,000		

BTEX contaminants were also found in soil within the supplemental remediation area beneath P.S. 156. Again, almost all of these contaminants are found in the groundwater or soil above the groundwater table. (This would be expected as the groundwater level fluctuates, often saturating the soil above it and leaving behind these compounds.) Most are within the first 12 feet of soil. **Table 4** shows the highest detection of BTEX that exceed RSCOs. The BTEX plume exceeding 1,000 ppb underlies the remediation zone.

Table 4
Maximum Detections of BTEX in Soil
P.S. 156 and I.S. 151
parts per billion

Only detections above Recommended Soil Cleanup Objectives (RSCO) are noted

Constituent	RSCO	Inside Remediation Area	Remainder of Site
Benzene	60	4,500	
Toluene	1,500		
Ethylbenzene	5,500	9,200	
Xylene	1,200	1,900	

Chlorinated Solvents

Even at low concentrations, chlorinated solvents such as PCE and TCE (as well as their breakdown products, such as vinyl chloride) in the soil or groundwater beneath a structure may pose a long-term health risk to building occupants through the “vapor intrusion pathway.” That is, breathing small amounts of toxic vapors that migrate from below over a long period of time may cause neurological problems, lung irritation, and cancers, such as kidney cancer. Some subpopulations, such as children and diabetics, are particularly susceptible.

Though concentrations of these compounds at the site are generally lower than those for BTEX and SVOC contaminants, because they are more persistent than BTEX in the shallow subsurface, they are more volatile than SVOCs, and particularly because they tend to sink in groundwater, they should be evaluated as a potential health risk.

In fact, the Public Health Exposure Assessment of the (Appendix II of the Remedial Investigation Report) identified one TCE soil gas sampling result, $240 \mu\text{g}/\text{m}^3$ underneath one of the planned new schools, above U.S. EPA’s screening levels for vapor intrusion.³ The planned school structure is designed to mitigate vapor intrusion, but the proposed excavation does not target this contaminant.

Chlorinated solvents may also pose a health risk at P.S. 156, but the preponderance of the limited data currently available suggests otherwise. The single soil-gas sample taken under P.S. 156 shows PCE at $1,200 \mu\text{g}/\text{m}^3$, well above U.S. EPA screening levels. Indoor air sampling recently conducted for the New York Department of Education found PCE in one classroom at $12.9 \mu\text{g}/\text{m}^3$, unacceptable in most jurisdictions but considered “safe” by New York state DOH. Still, if this school were constructed slab on grade, or with a small crawlspace, the Department of Health would require mitigation, based upon the soil-gas sample alone.

However, P.S. 156 is built on a platform erected on 30-foot pillars, and thus vapors emerging from the subsurface are likely to disperse into the outdoor air. Indeed, the two air samples taken by SCA beneath the platform show no detection of PCE—at least nothing above the detection limit of $.71 \mu\text{g}/\text{m}^3$. Since indoor air results differed significantly among the rooms at P.S. 156, the most likely explanation for the PCE “hits” is off-gassing from recently dry-cleaned clothes. Still, CPEO believes that additional investigation is necessary to determine conclusively what the source is of the PCE in indoor air at this school.

PLANNED REMEDIAL RESPONSE

The remediation strategy has five distinct components: excavation of the 300-by-125-foot rectangle; installation of hydraulic barriers; installation of a sub-slab depressurization system (SSDS) and vapor barrier beneath the new schools; capping the new campus area outside of the building footprint; and solidifying a small supplemental remediation area beneath P.S. 156.

³ Soil gas concentrations are typically about two or three orders of magnitude above concentrations in the indoor air resulting from the same source.

The excavation area will be dewatered and excavated to a depth ranging from 9 to 14 feet with the goal of removing the highest concentrations of BTEX as well as SVOCs. Confirmatory sampling will take place after excavation to determine if any of the remaining soil exceeds cleanup objectives. Excavated soil will be covered and disposed of at an approved off-site location.



Waterloo® Barrier (along center of photo)

The SCA has already installed hydraulic barriers to prevent contaminated groundwater from entering onto the school property. These barriers consists of a grout wall, created by high-pressure injection, to the west at the retaining wall, and a Waterloo® Barrier to the north. A Waterloo Barrier is a low permeability cut-off wall for groundwater containment and control. It is a new design of steel sheet piling featuring joints that can be sealed after the sheets have been driven into the ground. Monitoring wells are to be installed at the east end of the Waterloo Barrier and the southern end of the grout barrier, and retained at the Site boundary to monitor downgradient groundwater quality. The monitoring wells will be sampled quarterly for one year following installation of the barrier walls and semi-annually for the remainder of the construction to confirm that are no changes to existing groundwater quality. CPEO does not believe that the scope and duration of monitoring is sufficient. (See Concerns and Recommendations below.)

SCA has also committed to installing a vapor barrier and an active sub-slab depressurization system below the foundation of the new building. These should capture vapors that accumulate beneath the slab and vent them to the outside. A typical depressurization installation involves creating one or more suction pits below the concrete floor slab. Three or

four-inch diameter PVC pipes vent vapors to the outside of the buildings. Such systems may be operated with a fan (active mode) or without (passive). Pipe exhausts should be located at least 10 feet above the ground and 10 feet from doors or windows. As an added safeguard, the Remedial Action Work Plan Addendum committed to operate the heating, cooling and ventilation system for the new schools under positive pressure. Positive pressure tends to keep subsurface vapors from entering the building via cracks in the floor or other preferential pathways.

The remaining area outside of the school footprint, which showed the highest levels of SVOCs, will be covered by synthetic turf, pavement, or in small landscaped areas, two feet of clean fill. Though not included in the Remedial Action Work Plan, SCA has agreed that engineering controls such as the clean soil cap and other surface cover materials and institutional controls will be addressed in the Site Management Plan, to be developed following completion of excavation.⁴

The supplemental remediation area under P.S. 156 will be solidified to a depth of approximately 15 feet, by high-pressure grout injection, the same technology that was used to construct the hydraulic barrier west of the Mott Haven Campus. The process creates a continuous soil/cement monolith, by simultaneously mixing the soil and injecting a cement grout mixture. The main purpose of the *in situ* solidification is to eliminate any additional leaching of contaminants from the soil matrix into the groundwater system underlying the area. (According to the SCA's supplemental remediation plan, soil removal cannot be used because it might undermine the structural integrity of the platform and schools above.) Groundwater quality will be monitored downgradient for one year after completing the *in situ* solidification program to confirm that none of the contamination is leaching out and migrating further downgradient. During *in situ* solidification, it is possible that vapors now in the soil and groundwater will be released during the mixing process. We recommend that this activity take place when children and school employees are not in the building.

CONCERNS

The School Construction Authority has devoted a great deal of time and money to the investigation of the Mott Haven site and the development of the environmental response. This work has been conducted professionally, and those involved have been prompt and frank in discussing their work with CPEO and its subcontractor, Peter Strauss. Furthermore, the SCA plans to expend a significant amount of money implementing its planned remediation.

However, in any project of this magnitude, the insufficiency of data creates uncertainty, and whenever contamination is left in place above health-based objectives, the sufficiency of long-term management to prevent exposures is a potential subject of debate.

⁴ "Site management" means the activities undertaken as the last phase of the remedial program at a site which continue after a certificate of completion is issued. Site management is conducted in accordance with a site management plan, which identifies and implements the institutional and engineering controls required for a site, as well as any necessary monitoring and/or operation and maintenance of the remedy. (NYCRR Subpart 375-1.2)

Excavation Footprint

The decision to not remove any SVOC soil hotspots outside the footprint of the school buildings is a cause for concern. Cancer-causing compounds will remain on the property in concentrations well above Recommended Soil Cleanup Objectives. The SCA's consultant offered two explanations:

First, he reported that the concentrations of contaminants were typical of urban fill in New York City. This may be true to some degree, but CPEO is concerned about its implications. This explanation suggests that schoolchildren who live in the City are not entitled to the same level of environmental protection as students elsewhere.

The second explanation is more plausible. The contaminated areas will be paved or capped with two feet of clean fill to prevent exposure. This approach may turn out to be protective, but the removal of hotspots remains preferable. Unusual conditions, such as saturating rains, coupled with the inevitable failure of the caps, may create pathways for exposure to SVOC contaminants. If such pathways are not promptly closed, there may be an elevated, unacceptable health risk.

More important, this reliance on containment rather than treatment or removal—characteristic of many “cleanup” projects today—places a burden upon those responsible for long-term site management. That is, for long-life pollutants such as SVOCs, the caps and pavement must be maintained and potential exposures monitored for the life of the contaminants as well as any hazardous breakdown products. Because of the persistent nature of the contaminants at this site, a long-term management plan will carry with it an indefinite obligation.

Therefore, we find the failure to remove hotspots an inferior approach, but believe it can be made protective with a robust long-term management program. In addition, the assurances that protective capping will take place should be incorporated into the Remedial Action Work Plan (perhaps in a letter of addendum), not just the Site Management Plan, because it is an integral part of the cleanup project.

Long-Term Management

Unfortunately, there are few models for ensuring that long-term management, including maintenance and monitoring, is carried out as long as necessary. Leaving contamination in place may save money in the short run, but it can defer or transfer responsibility at a level that eventually becomes more costly than the initial savings—as well as creating a long-term risk of exposure.

In its January 9, 2007 letter to the New York City Council, the SCA promises to “develop and implement a long-term soil, water, and air monitoring program as required and approved by DEC.” It adds, “the SCA performs a building condition assessment survey on all of the DOE's [Department of Education's] school facilities on a regular, periodic basis and routinely incorporates the inspections of such engineering controls into this program.” Further, it states, “The SCA will report quarterly to Bronx Community Board ...” These are significant steps.

Monitoring is essential. Public oversight is the best mechanism to ensure that it is being done right. The letter also commits to a long-term monitoring plan for P.S. 156 and I.S. 151. As pointed out above, the proposed remedial action under P.S. 156 proposes one year of monitoring. This duration is not sufficient to determine if the remedy will work over a longer period. Furthermore, it should be integrated into a long-term monitoring plan that also addresses some of the concerns raised below under Off-Site Sources.

But three things are missing. First, the SCA and DEC should specify contingency plans or at least a contingency process for addressing monitoring results that show that unacceptable exposures are occurring. This applies not only to the cap, but to the hydraulic barriers and subslab depressurization system. A contingency plan would describe how SCA and regulatory agencies plan to address foreseeable problems, including routine, long-term contingencies and uncontrollable events (e.g., severe flooding) that could affect the stability of the proposed remedy. Potential contingencies can be divided into Technical Contingencies (e.g., failure of a hydraulic barrier, an increase in contaminant detections in groundwater, or increases in vapor concentrations), Logistical Contingencies (e.g., changes in personnel, funding, or land or building use), and Regulatory Contingencies (e.g., significant changes in regulatory standards or redefinition of the roles and responsibilities of the different responding agencies).

Second, steps should be taken now to ensure that those responsible for long-term management have the expertise, resources, and will to enforce environmental obligations far beyond the requirements of normal school facilities maintenance. Will school inspectors be trained to detect releases of SVOCs from the subsurface, as well as possible failure of the cover? If the Department of Education, the operator of the schools, will be responsible for any operations, maintenance, or monitoring, does it understand, accept, and have the funds to carry out such activity? The SCA should ensure that the relevant agencies commit now (in writing) to take the proper steps in the future.

Third, restrictions on activities that weaken or break through protective capping materials should be delineated in advance. These “institutional controls” should be memorialized in documents accessible to those responsible for operating the schools, other entities that might have reason to excavate at the site, and the public at large.

Groundwater

It is possible that the planned excavation and dewatering of the top nine to fourteen feet of soil will reduce the sources of volatile BTEX and VOCs on the property to the point where they do not pose a risk of vapor intrusion to the schools’ occupants. BTEX compounds are lighter than water, so they tend to accumulate at the top of groundwater. However, CPEO is concerned about the vapor intrusion risk from the lower concentrations of PCE, TCE, and vinyl chloride found on the site. These contaminants are heavier than water and thus will be found at the bottom of the water column. It is not clear whether excavation and dewatering activities will remove all contaminated media.

In evaluating the vapor intrusion risk, the Remedial Investigation Health Assessment contends, “The proposed remedy involving soil removal from the northwest corner of the Site

and off-site disposal will eliminate this potential exposure pathway.” This is true, however, only if the TCE contamination is confined to the soil. DEC officials believe that this is the case. They believe there were occasional and small releases of chlorinated solvents on the property, even though these compounds were not found in soil above RSCOs.

CPEO believes, however, that there is a possibility that PCE, TCE, and their breakdown products have migrated beneath the property as part of groundwater plumes that originate off site. PCE is found in at least one soil-gas sample to the west of the property. Furthermore, the presence in the groundwater of breakdown product dichloroethylene (DCE), which is not used as an industrial chemical, suggests that a nearby dry cleaner released PCE into the groundwater, and that the plume has migrated under the site and degraded as it moved. BTEX in the same groundwater may have fed the degradation process.

The small number of groundwater samples, with somewhat inconsistent results, leave room for interpretation. In response to CPEO’s concerns, DEC has suggested that there be new soil-gas sampling for chlorinated solvents, after excavation is complete, to determine whether the source has been removed. The City should commit to this testing in writing. Such sampling should also apply to other VOCs, such as BTEX.

Should any VOCs still be found in soil gas, then additional remedial activity should be implemented to remove the source. After construction, the depressurization system should operate in active mode around the clock. In addition, as long as soil-gas readings exceed U.S. EPA screening levels, the indoor air at the new schools should be periodically monitored for these compounds in each distinct airspace to ensure that mitigation systems (vapor membrane, subslab depressurization system), and HVAC (heating, ventilation, and air conditioning) are effective.⁵ This is a significant obligation, so responsibility and resources for conducting regular indoor air sampling should be established up front.

While the mitigation designs for the new schools appear to be standard, robust systems, care must be taken to ensure that membrane perforations do not introduce preferential vapor pathways—particularly if residual soil gas contamination is measured. In particular, since elevators can act as pumps, actually stimulating vapor intrusion, even to upper floors, elevator shafts should be carefully sealed.

Off-Site Sources

There is strong evidence that the gasoline-related contaminants, PCE, and manufactured gas plant wastes have migrated onto the former railyard property from the west. This poses a serious dilemma for school authorities. On the one hand, it is essential to protect students and employees at both the new and existing schools. On the other hand, educational funding should not be diverted to pay environmental costs that are the responsibility of other entities.

⁵ U.S. EPA’s screening levels for PCE are based upon an indoor air target of $0.81 \mu\text{g}/\text{m}^3$, corresponding to a risk of one excess cancer per million thirty-year exposures. New York state DOH’s PCE exposure standard is unusually high: $100 \mu\text{g}/\text{m}^3$.



Retaining Wall at Concourse Village West (street)

SCA's solution has been the construction of hydraulic barriers, to prevent additional inward migration of contaminants. However, such barriers are not indefinitely impregnable. Furthermore, their installation may actually divert contamination toward or under the existing schools, while the Waterloo Barrier between the existing schools and the Mott Haven campus is likely to create a "dam effect" for groundwater that would otherwise flow onto the Mott Haven Campus from the northwest. This effect will elevate the contaminants dissolved in the groundwater and may cause some additional soil contamination closer to the surface underneath the existing campus. Both the naphthalene plume and the BTEX plume will be affected.

The long-term solution, therefore, is to address contamination at the source, before it flows under the street at Concourse Village West. In December, 2006 one responsible party for gasoline-related contamination across the street from the schools agreed to a corrective action plan that specifies timetables for investigation and remediation. DEC has assured CPEO that this investigation will include sampling for PCE as well.

Meanwhile, DEC plans further investigation of manufactured gas plant wastes in this area. It is imperative, if the SCA's barrier strategy is to be effective, that an enforceable timetable be established for this project as well as any other investigations of contamination upgradient from both the existing schools and the new Mott Haven campus. In turn, the SCA must take steps to ensure that the deadlines in such a timetable are met.

Indoor Air at the Existing Schools

Teachers and others at P.S. 156 reported headaches, rashes, and other health complaints during pre-construction activity at the Mott Haven site. Reportedly, there was a limited amount of soil disturbance during that activity, but CPEO does not have adequate information to evaluate any relationship between the activity and the complaints. CPEO notes that the SCA is planning, for its major excavation projects, full dust containment and monitoring, but it is likely that, during both excavation and construction, dust, vehicle fumes, and noise from the Mott Haven site will be an inconvenience or distraction, even if not a significant health threat, at the existing schools.

In the short term, the SCA needs to ensure that the air monitoring equipment for the Community Air Monitoring Program is cleaned frequently to ensure that the VOC detection equipment is not fouled by dust. During heavy construction activities, the Photo Ionization Detectors (PID) should be cleaned on a daily basis and re-calibrated weekly.

Furthermore, as explained above, there is not enough data to rule out fully the possibility of vapor intrusion of PCE from the subsurface at the existing schools.

CPEO therefore proposes that the SCA install heating, ventilation and air conditioning systems at the existing schools. As at the new schools, the HVAC positive air pressure generated by operation would serve as additional insurance against the inward migration of toxic vapors. It would also allow the schools to close their windows during construction of the Mott Haven schools, reducing the impact of both noise and dust. The HVAC systems would have the additional benefit of creating, literally, a climate conducive to learning. It could also be designed to filter out ambient contamination, such as diesel exhaust, considered by some to be a health problem in the Bronx.

Beneath the Existing Schools

Although the remediation strategy for the existing schools would solidify contaminants in a small area below P.S. 156, the rest of the area underneath the two schools has no cover. CPEO proposes that this area be capped with asphalt to prevent contaminated particles and vapors from entering the environment. A cap, supported by periodic maintenance and long-term monitoring, will provide added protection for the occupants of the school.

Portions of this cap might be set aside for limited-use parking, if access, security, and emissions can be resolved. However, these questions are beyond the scope of this study.



Jet-Grout Waste under P.S. 156

Site Management Plan

In response to questions from CPEO, the SCA and its consultants have made it clear that the details governing engineering controls, institutional controls, site maintenance, and long-term monitoring will be addressed in a Site Management Plan. CPEO continues to believe that the Remedial Action Work Plan should at the very least provide general guidelines for any activity essential for protecting students and other site occupants. However, whether or not it is too late to amend existing documents, it is clear that many important decisions have been deferred to the Site Management Plan.

Therefore, the Site Management Plan should be developed with full public oversight. Drafts should be made available to the affected public. There should be ample time for public comment. And representatives of the concerned community should have continuing access to independent technical advice.

Furthermore, CPEO recommends that the Site Management Plan contain a commitment to conduct a formal review every five years, after completion of remedial construction, to determine whether the remedy remains protective. This review should be modeled after U.S. EPA's Guidelines for Five-Year Reviews at Superfund Sites, including full public oversight, as defined in the previous paragraph.

THE PROCESS

In cities throughout the United States, schools are being built on contaminated property, largely because convenient, uncontaminated parcels large enough to accommodate school buildings and recreational facilities are difficult to find. School construction agencies and environmental regulators thus face the challenge of convincing the public—students, parents, teachers, other employees, and neighbors—that sites will be remediated or that school occupants will be adequately protected from unsafe exposures.

The Mott Haven debate is but one of the more high profile examples. As the specifics of the Mott Haven case are resolved, it's valuable to stand back and learn some of the lessons from the approval process there.

The first lesson is that the environmental liabilities of such sites must be identified for public review before school-builders settle on a single site. That is, in evaluating multiple alternatives, environmental contamination and likely cleanup costs should be plugged transparently into the decision-making process.

Second, community-based skeptics of such projects should be incorporated as partners or problem-solvers in the process. This has two significant benefits: First, community concerns are more likely to be addressed by responsible agencies. Second, community members are more likely to support the results. At Mott Haven, community members (including staff at the existing schools)—aided by New York Lawyers for the Public Interest—have played a positive role, promoting indoor air sampling, regular meetings with the School Construction Authority, improved long-term management, a clearer focus on off-site sources, and this independent review. To be effective and constructive, community members need access to technical advice and interpretations that they can trust.

Third, environmental standards and processes designed to facilitate the industrial or commercial reuse of contaminated properties do not in themselves provide enough protection, or at least the public perception of protection, necessary for sites where susceptible populations such as schoolchildren will be required to spend their days.

RECOMMENDATIONS

This section summarizes the primary recommendations set forth in this report.

1. The School Construction Authority should consider excavation of semi-volatile organic compound hotspots in open-space areas at the Mott Haven campus.
2. The assurance that protective capping will take place on the open-space areas should be incorporated into the Remedial Action Work Plan.
3. The SCA and regulatory agencies should establish a robust, transparent, long-term Site Management Plan (for the life of the on- and off-site contamination), with an established process for addressing emerging exposures. The plan should include procedures for maintaining engineering controls, including vapor mitigation systems and protective caps (under the existing schools as well as on the new campus); institutional controls prohibiting soil disturbance; and long-term sampling protocols. In particular, groundwater monitoring adjacent to the hydraulic barriers should be extended until upgradient sources of contamination are eliminated. Contingency plans should be in place for addressing Technical, Logistical, and Regulatory contingencies, and there should be a schedule for periodic review of the protectiveness of the remedy.
4. New soil-gas sampling should be conducted subsequent to excavation to determine whether volatile compounds remain in the groundwater. If sampling detects VOCs above screening levels, then the SCA should undertake additional source remediation and commit to regular indoor air monitoring.
5. Enforceable timetables should be established for the remediation of all off-site contamination sources impacting the Mott Haven campus and adjacent, existing schools. The SCA should commit to secure a timetable for this work in writing from the DEC, and to taking actions to enforce its deadlines.
6. The SCA and Department of Education should evaluate installing heating, ventilation and air conditioning systems at P.S. 156 and I.S. 151
7. The dirt beneath the existing schools' platform should be capped with asphalt.
8. *In situ* solidification beneath P.S. 156, as well as any other remediation activity beneath the existing schools, should not take place when children and school employees are in the buildings.
9. Additional testing in and around P.S. 156 and I.S. 151 should be conducted to determine conclusively the source of PCE in the indoor air.
10. Elevator shafts should be carefully sealed so as to avoid acting as pumps for vapor intrusion.
11. New York City should establish a standard process for involving the affected public in the environmental review of school sites before preferred alternatives are selected. Furthermore, cleanup of school sites should be based on applicable standards that are no less stringent than those allowed for a restricted use/residential scenario.