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PCB TESTING IN VERMONT PUBLIC SCHOOLS

PRESENTED TO VERMONT HOUSE COMMITTEE ON EDUCATION

Representative Peter Conlon, Chair

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PRS POLICY BRIEF 2223-01
FEBRUARY 28, 2023

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EXECUTIVE SUMMARY

Between the 1930s and 1977, chemical companies such as Monsanto manufactured electrical equipment and building materials, including caulk and light ballasts, with human-made chemicals known as polychlorinated biphenyls (PCBs). Although PCBs were banned in 1979, a lack of removal efforts means they persist in many buildings constructed before that date, including many schools in Vermont. This report analyzes four components pertaining to this PCB problem: the current scientific landscape, testing and remediation, stakeholder perspectives, and a case study of New York City. First, we detail the negative effects of PCBs on the endocrine, nervous, reproductive, and immune systems, focusing specifically on the health effects of airborne PCBs. Next, we discuss the remediation strategies of abatement and mitigation, including air filtration, as well as the cost and safety trade-offs of each. In terms of stakeholder views, we discuss the concerns of superintendents, focusing on funding mechanisms and limited relocation options in the case of high PCB levels in their buildings. We also explore litigation against Monsanto, the chemical manufacturer, across the country. Finally, we discuss New York City, the first comparable school system to test for and remediate PCBs. We explore their caulk remediation strategy, best management practices in combination with occasional abatement, as well as how they improved public involvement and transparency. Finally, we present policy recommendations that reflect our findings.

1 INTRODUCTION

In September 2020, Burlington High School—the fourth largest public school in Vermont—discovered high concentrations of polychlorinated biphenyls and began complete reconstruction of the building.[1] Because 348 Vermont schools were built or renovated before 1980,[2] the Vermont House of Representatives passed Acts 74[3] and 166[4] in 2021 requiring schools to comprehensively test for PCBs in schools. Before the 1980s, PCBs were a common chemical used in electrical products like fluorescent light ballasts as well as construction materials like caulking and window glaze.[5] While most PCB-containing light ballasts have been removed from Vermont schools (see Appendix 9.3), PCBs are still present in building materials and secondary sources, which can off-gas airborne PCBs.[6] To pay for testing and mitigation, the legislature initially allocated $32 million. As of October 2022, the Vermont Emergency Board released an additional $2.5 million in emergency funds for schools to buy mitigation supplies.[7] We intend to inform the Vermont House of Representatives on the scientific and historical information surrounding PCBs, specifically focusing on the current scientific landscape of PCBs, various testing and remediation practices, stakeholder perspectives, and a case study of New York City.

2 PURPOSE STATEMENT

As Vermont is the first state in the nation to attempt comprehensive testing and remediation of PCBs in schools, much about airborne PCBs in schools is not yet fully understood. This report reviews a breadth of relevant literature about the health risks of PCBs in school settings, focusing specifically on the impacts of airborne PCBs. We reviewed the differences in health effects between types of PCB congeners, and looked at age-specific health impacts that may pertain to students and teachers.

This report explores the nuances of PCB testing and remediation. We first review Vermont requirements and the costs and benefits of Indoor Air Quality testing. We also observe how different conditions may influence the testing results. This report then investigates various methods to remediate PCBs, breaking them down by financial cost and reduction of airborne PCBs. Though all remediation methods have their drawbacks, in most cases they effectively reduce the concentration of airborne PCBs. Furthermore, this report assesses how HEPA filters and ventilation, originally installed for COVID-19, might reduce airborne PCB levels. This report also analyzes how schools across America handled funding and remediation efforts.

This report provides an analysis of stakeholder perspectives in Vermont and explores the public reaction to PCB remediation in other localities. We explore how various members of the Vermont school community currently feel about testing in Vermont, focusing on the cost of remediation, safety, and academic concerns.

Finally, we examine all three of these factors in a case study of New York City public schools, one of the only comparable examples of a large-scale government testing and remediation program. Through their problems and solutions, we intend to glean some lessons for Vermont in creating meaningful testing systems, mitigating PCBs in a cost-effective way, and managing public concern.

3 SCIENTIFIC LANDSCAPE

The term "PCB" refers to a class of chemical. Because PCBs are "polychlorinated," individual compounds within the broader PCB category have differing numbers and positions of chlorine atoms. The class of "PCBs" is divided into 209 distinct congeners, where the term congener refers to an individual compound. These congeners are then classified as either lower- or higher-chlorinated based on the number of chlorine atoms in the compound. Airborne PCBs, like the ones found in schools, are predominantly lower-chlorinated, while PCBs found in food are higher-chlorinated. Making this distinction is essential because these disparate types of congeners might have different health effects. However, due to difficulties in separating out the effects of individual congeners, many studies focus on health effects of PCBs as a class, without indicating whether particular types of congeners are correlated with each effect. This information gap complicates attempts to provide a broad picture of the current safety landscape. We conducted a literature review to ameliorate this gap and discern the health effects of airborne PCBs.

3.1 METHODOLOGY

To conduct our literature review, we identified seven key terms that encapsulate most of the relevant research surrounding PCBs: "lower-chlorinated PCB," "airborne PCB," "PCBs in schools," "PCBs in caulk," "PCB neurological," "non-dioxin-like PCB," and "PCBs in schools health effects." Four relevant studies were examined for each term, two from Google Scholar and two from PubMed. The results from each term were then compared to gain a broader picture of the established research.

In addition to our literature review, we conducted interviews with multiple researchers investigating differing aspects of PCBs. Interviewees were predominantly from the Superfund Research Program at the University of Iowa. For a full list of interviews, see Appendix 9.1.

3.2 LITERATURE REVIEW RESULTS

Many studies did not specifically indicate the mode of exposure (dietary or inhaled) linked with their health effect findings. As a result, the literature review findings are separated between studies that did not indicate the mode of exposure (non-indicated results), and studies that focused specifically on airborne or lower-chlorinated PCBs (indicated results).

3.2.1 NON-INDICATED EFFECTS

Without distinguishing between ingested and inhaled PCBs, the chemical affects multiple systems within the body (immune, reproductive, cardiovascular, and endocrine) and is carcinogenic.[8] In 2016, the International Agency for Research on Cancer concluded that there is sufficient evidence that PCBs are carcinogenic in humans, causing melanoma and having strong positive associations with non-Hodgkin's lymphoma and breast cancer.[9] Additionally, both animal and human studies show associations between exposure to PCBs and cancers including prostate, testicular, pancreatic, lung, and mouth.[10]

Within the immune system, effects include the shrinking of the thymus, which makes white blood cells to protect the body against infections; this leads to a suppressed immune response.[11] Research also suggests that exposure might affect the effectiveness of vaccines. Reproductive system effects in women include damaged ovarian function, premature ovarian failure, infertility, altered menstrual function, and an increase in miscarriage risks.[12] In men, effects include reduction in semen quality and fertility, and a change in sperm concentration, motility, and morphology.[13] Within the cardiovascular system, exposure can lead to an increased risk of hypertension and stroke.[14]

Endocrine system effects include thyroid disfunction and an increased risk of diabetes.[15] Specifically, of 15 studies that investigated the correlation between PCB exposure and type two diabetes, nine of these demonstrated positive associations.[16] Some studies have also found a correlation between exposure and obesity, although of twenty-four studies investigating this correlation, only 24 percent of these displayed positive associations between the two.[17; 18] PCBs are a confirmed human carcinogen in adults, though their carcinogenic status in children is not well-investigated.

Studies observed effects on the nervous system of exposed children, as well as a multitude of effects from prenatal exposure. In general, effects of exposure to PCBs can be much greater in children. Children weigh less than adults, so the intake of PCBs per kilogram of body weight may be greater than that of adults, even if both groups are exposed to the same amount of PCBs. Additionally, the brain and body of children are still developing, so the effects of PCBs on these systems can be more profound after exposure.[19] Specifically, nervous system effects in children include impaired cognitive function and attention, learning, and memory deficits.[20] Furthermore, some studies found associations in children between exposure and an increased prevalence of ADHD and Autism Spectrum Disorder (ASD).[21] Postnatal exposure in children was associated with a higher prevalence of recurrent middle ear infections and chicken pox.[22] However, higher prenatal exposure was associated with a lower prevalence of chicken pox.[23] Higher prenatal exposure is also linked with earlier pubertal development, which in turn is linked with a higher risk of breast cancer in girls, testicular cancer in boys, and a higher incidence of mental health problems in both sexes.[24]

Multiple additional effects are linked with prenatal exposure. First, prenatal exposure has negative effects on motor and cognitive development, although some research has shown that a positive home environment could compensate for these negative effects.[25] Prenatal exposure is also inversely associated with birth weight and growth rate for children aged 0-3 months.[26] Furthermore, prenatal exposure affects the academic outcomes of children, though research is mixed on whether these effects are positive or negative. Some studies found that prenatally exposed children had lower IQ scores, persistent developmental delays, and a greater risk of cognitive impairment than unexposed children.[27] However, five studies on prenatal exposure reported more optimal development after higher exposure, and another study found both positive and negative associations with ADHD development in children after exposure.[28]

Overall, PCBs have a wide range of health effects relating to multiple different systems within the body. However, not all research demonstrates negative effects, particularly when examining correlations between exposure and obesity, type 2 diabetes, and ADHD development in children after prenatal exposure. Many studies also indicate the need for further research. For example, one study noted that future research on the effects of prenatal exposure on neurological development was needed.[29]

3.2.2 INDICATED EFFECTS

Lower-chlorinated (LC) and higher-chlorinated (HC) congeners have different toxicological profiles, meaning that without further research, the health effects listed in Section 3.2.1 cannot be assumed to apply to specifically LC congeners.[30] PCBs in schools are airborne, and airborne PCBs are primarily LC. We examined research focusing specifically on the health effects of these LC congeners to get a better sense of the effects children and teachers might face after school exposure. Research on these effects primarily focused on two key topics: PCB levels in the bodies of exposed teachers and children, and the health effects of airborne PCBs.

Multiple studies have demonstrated that PCB-contaminated indoor air leads to increased concentrations of LC congeners in the blood of exposed teachers and students.[31] For example, a study conducted in Denmark found that exposure to contaminated air within apartment buildings can contribute to "body burden," or the amount of a chemical in the human body.[32] Elevated body burden levels were seen in people living in contaminated apartments, even for those who had resided there fewer than five years.[33] Within schools, a similar effect is observed for both students and teachers. There was a positive association between the number of years spent at a contaminated school, and the levels of LC congeners in 377 children in Greater Boston.[34] Furthermore, the levels of 13 congeners, primarily LC, were twice as high in 18 teachers in these schools as compared to members of a reference group.[35] Thus, the occupants of contaminated buildings have elevated levels of multiple LC congeners.[36]

The toxicity of LC congeners has been studied less than that of higher-chlorinated (HC) congeners.[37] However, research on specifically airborne (LC) PCBs has found that many of the health effects described in Section 3.2.1 do apply to LC PCBs. For example, airborne PCBs are similarly neurotoxic, act as endocrine disruptors, and affect the reproductive system.[38] Other effects include increased risk of stroke, hypertension, type two diabetes, and cardiovascular disease.[39; 40] Furthermore, some research suggests that LC congeners are more toxic than HC ones when considering neurotoxic and reproductive effects.

Findings on the carcinogenicity of LC congeners are mixed. Airborne PCBs, including ones found in schools, are predominantly classified as non-dioxin-like (NDL).[41] One recent study found that NDL PCBs promoted tumor activity in mice.[42] Additionally, on the cellular level, LC PCBs increase intracellular oxidative stress, which can lead to cell and protein damage.[43] However, a 2022 study that examined the risk of cancer from residential airborne exposure only found higher cancer risks for specific types of cancer. For example, the results did not show a correlation between exposure and a higher risk of malignant melanoma or breast cancer, but residents of more than 2.9 years did have a higher risk of both liver and pancreatic cancer.[44] This study was the first to examine cancer risk following residential airborne exposure, so it is possible the findings will be refuted or fail to be replicated in future studies.[45]

Studies have also examined a wide range of neurological effects. One animal study found that prenatal exposure to airborne PCBs was correlated with changes in behavior, learning, and memory functions.[46] Exposure to NDL PCBs has been shown to change dopamine levels in the brain through inhibiting dopamine transporter binding, with a potency comparable to the inhibitive properties of cocaine.[47]

LC PCBs have similar endocrine effects as the ones described in Section 3.2.1. Specifically, a study done in rats found that exposure was correlated with elevations in thyroid hormones, indicating that LC PCBs interfere with hormone homeostasis, an important regulatory process within the body.[48] Similarly, studies have shown that LC PCBs have estrogenic and anti-androgenic, or estrogen-producing and testosterone-blocking, properties.[49; 50] A related study found LC PCBs are associated with lower levels of luteinizing hormones, which stimulate female reproductive processes like ovulation.[51]

Prenatal exposure to LC PCBs has also been linked to a range of effects. First, LC PCBs may cross the placenta at a higher rate than HC PCBs, making them more likely to affect the fetus.[52] Furthermore, if the mother is exposed during her first trimester, there is no difference in the risk of preterm birth compared to a non-exposed mother, but there is a twenty-eight percent higher risk of major malformations in the child of the exposed mother.[53] Additionally, exposed mothers have a seventy-three percent higher risk of giving birth to sons with cryptorchidism, or undescended testicles, a condition that can affect male fertility.[54]

The effects of prenatal exposure are relevant when considering the Vermont teaching workforce. As of 2018, over seventy-five percent of Vermont educators were women.[55] If female teachers are exposed to PCBs in schools and later get pregnant, it is likely their infants will experience many of the prenatal exposure effects described above.

Research on specifically airborne, lower-chlorinated, and non-dioxin-like PCBs remain limited. However, existing research has demonstrated multiple negative health effects including endocrine disruption, cryptorchidism resulting from prenatal exposure, and neurological effects. While some research indicates the carcinogenicity of LC PCBs, recent research does not show correlations between exposure and certain types of cancer. Many studies also noted topics where further research is needed. Specifically, larger cohort studies are needed to investigate the health effects and safety of airborne exposure during pregnancy.[56] Additionally, more chronic exposure studies are needed, as well as an exploration of why LC congeners might be more toxic than HC ones.[57; 58] Finally, throughout the literature review, there were few current studies focusing specifically on the effects of airborne PCB exposure on children in schools. As a result, it is difficult to conclusively state which, if any, of the health effects described above will pertain specifically to the schoolchildren of Vermont. However, the long list of negative health effects suggests airborne PCB exposure *is* an emergent problem for both the students and the teachers in contaminated schools.

4 REMEDIATION

If testing discovers unsafe levels of PCBs in schools, remediation measures are essential and lawfully required. The options for PCB remediation include physical removal of the caulk or ballast, encapsulation, ventilation, physical barriers, administrative controls, and cleaning. These options all have different costs and effectiveness in mitigating PCB exposure. Schools across the U.S. have handled PCB remediation differently.

4.1 METHODOLOGY

To conduct our statistical analysis in Section 5.2.5, we used data from the "Sampling" section of the PCBS in Schools website (https://www.pcbinschools.org), excluding NYC schools, non K-12 schools, and schools with non-publicly available information.[59] We then analyzed twelve schools (see Appendix 9.2) in six states.[60; 61; 62; 63; 64; 65; 66; 67; 68; 69; 70; 71] Although this is a small sample size, the analysis provides context as to the choices of each school in funding remediation, remediation method, need for closure, cost, and date. The data was primarily compiled using online news articles and publicly available remediation reports, so the data is thorough but may not be completely comprehensive. Section 5 relies on informational interviews with PCB remediation experts and communication with Efficiency Vermont. For a full list of interviews, see Appendix 9.1 from 17-19.

4.2 TESTING

Due to the aforementioned variation in health effects by age, the Vermont Department of Health current indoor air School Action Levels (SAL) are 30 ng/mg^3 for Pre-K classrooms, 60 ng/mg^3 for K-6th grade classrooms, and 100 ng/mg^3 for 7th grade classrooms and above, based on guidance from 2021.[72] The Immediate Action Level (IAL), which is when the room or space should not be used until mitigation measures are taken, is three times the SAL. The SAL and IAL values are derived based on both EPA guidelines and a research-backed screening value of 15 ng/mg^3 based on cancer and noncancer health effects.[73] Vermont also tests schools in groupings of rooms that are considered to have similar PCB-containing products.[74]

The Vermont Department of Environmental Conservation conducts Indoor Air Quality (IAQ) Testing in schools to determine if PCB levels in indoor air exceed the SAL.[75] There are other options to test PCBs, including wipe samples and suspect building material testing. However, IAQ Testing is the preferred method for schools to measure the exposure level in the air for students and staff during a typical school day.[76] IAQ Testing does not rule out the presence of PCBs in building materials that do not off-gas. Moreover, seasonal, heating, ventilation, and temperature conditions can affect IAQ Testing results, with higher temperatures and poor ventilation leading to higher measured concentrations of PCBs.[77]

Further testing is required when indoor air results exceed the SAL to determine the extent and source of the elevated PCB levels. After remediation, testing is required to verify decreased presence of PCBs.[78] See Appendix 9.4 for information on federal testing regulations.

4.3 PCB REMEDIATION OPTIONS

There are two primary remediation strategies if PCB levels exceed SAL values: abatement, which permanently removes PCB materials at a higher cost, and mitigation, a more cost-effective approach to control exposure without direct manipulation of materials. HEPA filters and ventilation are also possible short-term options for lowering PCB levels in indoor air.

4.3.1 ABATEMENT AND MITIGATION MEASURES

The main abatement measure is physical removal of PCBs. Removal of PCB-containing caulk around windows, bricks, and concrete panels is often a first step in remediation.[79] There are various types of physical removal methods, including the use of hand tools, abrasive blasting techniques, and chemical removal options. As manufacturers commonly used PCB fluid in fluorescent light ballasts, the removal of these light ballasts is also an important step in mitigating PCBs.[80] After 1978, the federal government banned PCBs and required PCB-free ballasts to be labeled "No PCBs," meaning unlabeled, PCB-contaminated ballasts are easy to find and replace.[81] In the New York City school project, after the removal of light ballasts, indoor air PCB concentration in one of the classrooms decreased from 2950 ng/mg^3 to 81 ng/mg^3.[82] Although most high-use light ballasts have likely been replaced (see Appendix 9.3), the PCB-containing light ballasts remaining in Vermont schools likely contribute heavily to airborne PCB exposure and require only a visual inspection to remove.

In addition to emitting into the air, PCBs frequently and easily migrate from their primary source to secondary sources.[83] Therefore, physical removal may also include the removal of entire windows, flooring, or paneling with PCB-containing secondary source material, which may jeopardize the integrity of a building and warrant a capital improvement project.[84] Physical removal may include the excavation of PCB-containing soil.

The primary mitigation measure is contact encapsulation, in which sealant products are used to encapsulate exposed interior or exterior caulk. Encapsulation can also be used to cover PCB-containing paint. The sealant is demonstrably effective for at least, but usually more than, five months, and site managers must monitor the encapsulated material to ensure the integrity of the seal over time.[85] Thus, encapsulation may still allow for some exposure if the encapsulant becomes damaged or deteriorates, but is an easy and cost-effective remediation method to implement.[86] Moreover, in a study of a PCB-contaminated elementary school, encapsulation of interior caulk behind heaters and unit ventilators decreased normalized indoor air concentrations of PCBs by 40 percent.[87] Nonetheless, it is common practice to use mitigation as a temporary solution to limit PCB exposure in schools until abatement is possible. Upon remediation, encapsulation reduces air emissions most effectively in secondary sources, such as encapsulating residual PCBs after removal.[88]

Proper ventilation is also an effective mitigation option to decrease the concentration of airborne PCBs. In a pilot study with three New York City school buildings, increased ventilation and outdoor flow decreased the concentrations of PCBs to within EPA guidelines, though this was after the removal of contaminated caulk.[89] Thus, in PCB-remediated classrooms, ventilation lowers PCB concentrations substantially. Moreover, improvements or upgrades to existing ventilation systems can be effective at lowering concentrations of PCBs in indoor air.[90] However, increased ventilation has the potential to spread PCB-contaminated dust onto surfaces in a school, though frequent cleaning of surfaces limits this effect.[91]

Additionally, physical barriers, administrative controls, and cleaning are further mitigation options.[92] Physical barriers, such as a construction of a wall or fence, can be used to separate areas with PCB-contaminated materials. These barriers can minimize direct contact with PCBs, especially with young children, and mitigate airborne emissions.[93] Space can also be assigned strategically, where young children are put in classrooms with the least amount of PCB exposure.[94] Furthermore, consistently cleaning surfaces with microfiber maintains lower levels of PCB-contaminated dust.[95] The Best Management Practices for PCBs include regular inspections to check for deteriorating PCB caulk, stringent cleaning methods, and maintaining essential building systems, like the HVAC system.[96]

Nonetheless, one remediation practice alone usually does not suffice. Woodard & Curran, an engineering consulting firm, utilizes a four-step approach of cleaning, removal, re-caulking, and management of the encapsulation. Ventilation also tends to be necessary after removal or encapsulation to flush out PCB-containing air particles. Situations, however, are extremely case-by-case and one solution may not be sufficient in another school, depending on where the PCBs are located, the needs of individual schools, and cost.

The EPA recommends that all schools built or renovated between 1950 and 1979 remove PCB-containing fluorescent light ballasts, caulk, and paint, as well as consider encapsulation.[97] Moreover, the Toxic Substances Control Act requires that PCB-contaminated materials, like removed caulk, must be tracked and disposed of as hazardous waste.[98]

4.3.2 AIR FILTRATION

Operating with federal COVID-19 funding, Efficiency Vermont has worked with 365 Vermont public and independent schools to improve indoor air quality through air purifiers and HEPA filtration.[99] Thus, a question to consider is whether this pre-existing ventilation and air cleaning infrastructure put in place during the pandemic helps to mitigate airborne PCBs. Both air purification and the aforementioned ventilation seem to lower levels of PCBs in the air, but not always below safe thresholds. Moreover, air filtration is only a temporary solution, as it does not remove the original source of PCBs.

HEPA filters can therefore be used as a transitory remediation option. In a study of an elementary school with PCB contamination, the normalized median concentration of PCBs in indoor air was reduced by 66 percent due to increasing ventilation rates in classrooms.[100] This included replacing filters, repairing fans in unit ventilators, and adding HEPA-filtered outdoor air. Moreover, PCBs may be sufficiently large compounds that can be somewhat removed from the air using a HEPA filter.

Air cleaners with activated charcoal seem to also reduce PCB concentrations temporarily. In an October 2010 study, an engineering company took air samples from two closed school classrooms, where two portable air cleaners with activated charcoal were operated for twenty-four hours prior. The measured PCB concentrations in the rooms decreased from 209 $ng/mg^3$and 364 ng/mg^3 prior to filtration to 80 ng/mg^3 and 111 ng/mg^3, respectively, in the last eight hours of air cleaner operation.[101] These results suggest an approximate threefold reduction in indoor air concentrations of PCBs due to air cleaners, though the sample size was small. However, in another study, when clean air was flushed into a room with PCB contamination, the levels initially decreased, but it took less than thirty minutes for PCB emissions to return to prior levels within a closed door. Thus, air filtration is an extremely short-term fix.

4.3.3 COSTS ASSOCIATED WITH PCBS

Currently in Vermont schools, costs to conduct PCB Indoor Air sampling have ranged from $7,741 to $60,548.[102] However, these costs may not reflect the full amount of testing required, as further testing is necessary if Indoor Air results exceed the SAL and require remediation. These added testing costs can grow to be quite expensive, as PCB testing is more labor intensive and thus becomes more costly than testing for lead or asbestos, for instance.

In terms of PCB remediation, costs can vary widely depending on the extent of contamination and the situation, ranging anywhere from $10,000 to several hundred thousand dollars.[103] Physical removal of caulk usually costs between $100 to $200 per linear foot of caulk.[104] During a New York City Schools pilot study, removal of a light ballast and fixture cost between $1,500 to $1,700 per fixture.[105] Soil excavation costs were approximately $950 to $1,267 depending on concentration.[106] Window removal cost was the least expensive at $17 per linear foot of caulk, but does not include the expensive capital improvement project costs.[107] With physical removal, the costs associated with cleanup and toxic waste disposal can become extremely high. In this study, transportation and disposal costs ranged from approximately $8,000 to $43,000.[108]

Encapsulation is a far less expensive option, as there is little cost associated with cleanup. The encapsulation of interior caulk is approximately $53 per linear foot and $29 per linear foot of exterior caulk.[109] While encapsulation may be the cheaper option in the short-term, required continued testing may mean long-term ongoing costs. Furthermore, physical removal may still be necessary in future, leading to increased costs. Physical barriers, administrative controls, cleaning, and ventilation tend to be extremely low cost, but may still require mitigation practices.

In general, the average cost to remediate a building, depending on the amount and accessibility of PCB-contaminated materials, ranges between $9 to $18 per square foot of indoor building space.[110] Nonetheless, there are more costs associated with management of PCBs in schools aside from abatement and disposal. Administrative, technical, assessment, and construction-related costs alone can account for one third to one half of the total cost of remediation.[111]

In addition to monetary costs, there are emotional and learning costs to students depending on remediation options. A need to close school or move to remote learning can lead to learning difficulties for students.

4.4 ANALYSIS OF SCHOOL ACTION IN U.S.

An estimated 12,960 to 25,920 schools may have been built throughout the United States with PCB-containing construction materials.[112] According to the EPA Region 10 Summary in 2016, approximately 60 school districts in that region have found PCB contamination since 1998.[113] In EPA Region 2, 10 schools, excluding NYC schools, also had PCB-containing building materials as of 2016.[114] As more schools test for and find elevated levels of PCBs, these schools have had to make decisions as to how to manage and fund remediation.

In our analysis of the twelve schools on the PCBs in Schools website (see Appendix 9.2), we found that all schools contained at least caulk as a PCB-containing material. Moreover, half of the schools had to temporarily close due to PCB contamination or remediation. Three schools had to be demolished due to extreme contamination due to PCBs, while at least half required mitigation measures of physical removal.

For costs that were publicly available, costs of remediation ranged from approximately $14,000 to $195 million. All schools funded remediation at least partially through local taxes, although 25 percent received state aid. In general, five out of the twelve schools were involved in litigation, with three suing Monsanto and resultantly one settling and two losing in court, while two were sued by various organizations for adverse health effects and negligence. French Hill Elementary School in Yorktown Heights, NY, one of the first schools to test for PCBs in 2005, was the first school district to sue Monsanto, settling for $15 million in court.[115]

5 STAKEHOLDER PERSPECTIVES

Vermont superintendents and leaders have varying opinions and concerns regarding PCB state testing and funding allocations. The closure of Burlington High School (BHS) drew public attention to PCBs, although some parents seemed more concerned with the school closure than the health effects of PCBs. In the broader United States, public salience appears low in states and districts that have not tested for PCBs, though the *Get Toxics Substances Out of Schools Act of 2021* was introduced in Congress to give grants to monitor and remediate hazardous substances in schools.[116] However, some cases demonstrate that litigation against Monsanto can lead to large payouts that districts may be able to use to remediate or reconstruct school buildings.

5.1 METHODOLOGY

We conducted interviews and corresponded with various Vermont superintendents that have undergone state testing, as well as with Vermont school and town leaders. For a full list of interviews, see Appendix 9.1 from 8-16. We also reached out to Mark Lieberman, an EdWeek reporter (see Appendix 9.1), for survey methodology information about a school leader PCB survey.

5.2 NEWS OUTLETS AND PENDING LITIGATION IN BURLINGTON

After Burlington High School detected PCBs, the school subsequently closed, with students now taking classes in a former Macy's department store until the school can be demolished and rebuilt.[117] Both parents and educators have expressed concern over the PCB results and subsequent school closures. In early October 2022, two former BHS educators filed a federal lawsuit against PCB manufacturer Monsanto, arguing that PCB exposure caused reproductive problems and cognitive issues.[118] The district is seeking money from the lawsuit to cover the cost of rebuilding the school, in addition to asking for state and federal grants, essentially blaming Monsanto for the school closure.[119] As of the January 17th report, BHS will still have to pay millions of dollars for the demolition and cleanup of the school, but will get some money from the state.

Parents, on the other hand, blame the school closure on the health department and the state. In November 2021, Vermont raised the levels of PCBs allowed in schools, leaving many parents feeling as though the school closure was for nothing, as many of the levels in BHS buildings did not exceed the new level. One BHS parent was quoted as saying, "They introduced all this anxiety, fear, disruption into people's lives, effectively over nothing."[120] Furthermore, parents quoted in various newspaper articles expressed desires for state toxicologists and the head of the state testing program to resign.[121] The parents appear to prioritize the social and emotional benefits of keeping school open, while the educators seem more concerned with health effects of the PCBs.

5.3 VERMONT SUPERINTENDENTS AND LEADERS' OPINIONS

Although school leaders that had elevated PCB levels in their schools tended to have more animated views, almost all school leaders held similar views on funding. Most school leaders were concerned about local taxpayers having to pay for the remediation efforts through the Education Fund if PCB testing exceeds the SAL. Moreover, due to these large remediation costs, schools may have to cut activities or staff members to afford to comply with state regulations.

School leaders are grateful for receiving any state aid. For example, through the recent 80/20 cost share decision, funding will be provided on a first-come, first-served basis with certain assessment, mitigation, and cleanup costs that cannot be exceeded.[122] However, there is still concern. Small or under-funded schools do not have enough room in their budgets to incur even 20 percent of the remediation costs. Many leaders are calling for 100 percent state reimbursement, as they had little input on the testing mandate. In rural towns, there is concern about the lack of a relocation option. BHS was able to relocate, but these towns do not have a Macy's or other option for relocation. Some schools also do not have the time and resources to plan and coordinate PCB testing and remediation, and it has been labor intensive for their principals.

Of course, the largest concern is to make sure the learning of students is not affected by PCB testing and possible remediation. School leaders were opposed to returning to virtual learning and would prefer to not cause disruption to the typical school day. Some superintendents also voiced concern over the differing SAL depending on age, stating parents would likely not support relocating certain age groups into borderline contaminated rooms.

There was largely positive feedback that the state testing process was straightforward. However, communication prior to and after testing could have been improved. Multiple school leaders indicated the difficulty in being the first state to implement comprehensive PCB testing, citing growing pains. In schools where elevated PCB levels were detected, there has also been extremely little parental response, though some schools have received more complaints than others.

5.4 OPINIONS ACROSS THE U.S.

There is some disagreement surrounding the EPA guidelines for safe PCB contamination levels, with some experts arguing that PCBs can be harmful at far lower levels than what the EPA has established.[123] Additionally, under federal law, schools are not required to test for PCBs, and there is no federal funding provided for schools that do test.[124] However, in 2021 Senator Ed Markey introduced a bill with 10 cosponsors, including both Vermont senators, that would amend the Toxic Substances Control Act to authorize grants for remediation of toxic substances in schools. The bill remains in committee, but its introduction indicates that toxic substances such as PCBs have at least some salience.[125]

Nonetheless, an EdWeek Research Center survey from September 2022 of school and district leaders across the nation, found that the largest impediment (28 percent) school districts face when it comes to testing school buildings for PCB contamination is a lack of awareness of what PCBs are.[126] Twenty-six percent of schools also found the cost of PCB remediation to be the largest impediment.[127]

In areas that have tested and discovered high levels of PCBs in schools, the public has pressured administrators and legislators to fix the problem. For example, parents in Malibu, California filed a lawsuit against the Santa Monica-Malibu Unified School District after PCBs were discovered in window caulk at thousands of times higher than the federal limit. A federal judge later ordered the school district to remove PCBs from its schools by the end of 2019. Parents, including celebrity Cindy Crawford, also advocated for the EPA to require all schools built between 1950 and 1979 to test for PCBs, though the EPA did not make this change.[128]

In early October 2022, a jury awarded $55 million in compensatory damages and $220 million in punitive damages to 13 children and families of children who attended the Sky Valley Education Center in Monroe, Washington.[129] In their lawsuit against Monsanto, over 200 students, parents, and teachers alleged that exposure to PCBs in light fixtures and building caulk at Sky Valley caused them neurological injuries and led to potentially life-altering cognitive deficits.[130] The plaintiffs also claimed that Monroe School District made public assurances that the school was safe, while failing to respond to the environmental hazards in a timely manner.[131] Previous juries in this case returned plaintiff verdicts in amounts of $62 million, $185 million, and $21 million, which are some of the largest awards nationwide for individual PCB exposures.[132] Therefore, it seems as though litigation at this large of a scale has not been previously pursued by schools that have found PCBs through testing.

Moreover, in February 2022, New Hampshire reached a $25 million settlement with Monsanto for PCB contamination of state waters, after PCBs in water affected the fishing industry.[133] This indicates litigation against Monsanto is a possible option for Vermont.

6 CASE STUDY OF NEW YORK CITY

At present, the New York City public school system is the only considerable educational system in the United States to complete a PCB testing and remediation program. Though New York City faced a somewhat different set of problems, its program serves as a valuable case study to inform the approach of Vermont.

6.1 METHODOLOGY

Aside from publicly available documents, we used public data and interviews to investigate the NYC program. The data was cleaned in SQL and analyzed in R. We also conducted several interviews that investigated the administration, technical methods, and public response of the program. For a full list of interview subjects, see Appendix 9.1 from 20-23.

6.2 TESTING AND SCIENCE

Instead of testing every school, NYC tested a subset of schools to explore the impact of individual PCB sources and create generalizable data for the rest of the system.[134] After generating data from five schools over three years, they created models for which schools needed remediation most immediately, along with recommendations for best practices, which is discussed further in 3.4.2.[135] While Vermont is pursuing a more comprehensive approach to testing, certain elements of the NYC protocol may be useful.

For their specific testing protocols, they prioritized collecting data at a variety of locations, times, and conditions, because PCB levels can vary greatly across all these scales. Spatially, considering the impact that temperature has on PCB off-gassing, they emphasized testing south-facing surfaces, which tend to receive more solar warmth, as well as rooms with open heating elements like radiators. Temporally, they tested during weekends or holidays throughout the year to get a breadth of data. They occasionally had to test at night as to not disrupt the school day, though this is less accurate when considering the different temperature conditions during the school day. Due to the impacts of radiators and HVAC on airborne PCBs, they prioritized collecting data during the heating and non-heating seasons. In terms of conditions, the program eventually settled on testing during normal operating conditions. For example, if a classroom always has significant outgoing ventilation, that ventilation should be on during the testing period. While the pilot study initially included some results from precautionary tests, the EPA and NYC schools later decided it would make more practical sense to test under accurate circumstances.[136]

Since the NYC program intended to create data for other large-scale remediation programs, there were trials with passive testing systems that could provide significantly cheaper, less-disruptive testing systems.[137] Passive samplers do not have moving machinery or require electricity; they are an object, usually a piece of polyurethane foam, that absorbs airborne PCBs without needing any energy or making any noise. When these systems are benchmarked against active testing systems to see how the measurements should be adjusted, they can provide reasonable precision and accuracy. Though it would be important to consider curiosity from students, they would also be able to test over a long period of time while students are still in school. The specific model used in the NYC test program was the Tisch Environmental Model TE-200-PAS. With a different testing protocol and more research, these passive samplers could make testing more accurate and feasible over the long-term.[138]

6.3 REMEDIATION

As mentioned above, the NYC program began with a pilot study to assess how levels of airborne PCBs responded to various remediation and mitigation strategies. The New York City School Construction Authority contracted TRC Companies to produce a Remedial Investigation Report, which measured changes in various PCB levels after remediation strategies, as well as a Feasibility Study, which reported the costs and challenges of each method.[139; 140; 141] The reports concluded that a system of best management practices, mainly through regular cleaning and ventilation, was the most effective mitigation strategy for PCB caulking.[142] The data also demonstrated that removal of PCB-containing light ballasts was the remedy that most significantly and practically reduced airborne PCB levels, so NYC focused most of its abatement measures into replacing light ballasts.[143]

While PCB-containing light ballasts are not as prevalent in Vermont and require a different remediation method, some of the strategies from implementation in NYC may be useful. Given limited funds and available contractor work, NYC divided schools that likely required remediation into seven priority groups based on age of students and time of construction (see Table 6.3.1).[144] This considers that younger students are more vulnerable to the developmental symptoms of PCBs and that certain periods of construction pose a greater risk of contamination.[145] While NYC eventually dropped this specific, ten-year timeline due to public concern, it gives an example of a stratified roll-out, which may be necessary if Vermont schools need specialized, limited contractor work for caulk remediation.

Table 6.3.1. *Different priority levels of remediation.* ***** *- these schools started/ended remediation before given year due to litigation that compressed the timeline. Building Count is as of 11/30/2012.*[146]

Category	Description	Estimated Start Year	Estimated End Year	Building Count
In Progress	Remediation in progress, including planning or design	2013	2016	107
Priority 1	School buildings with visual deterioration	2013	2017	145
Priority 2	School buildings constructed between 1950 and 1966 with elementary students	2015	2018*	88
Priority 3	School buildings constructed between 1950 and 1966 with secondary students	2016	2018*	27
Priority 4	School buildings constructed between 1967 and 1979 with elementary students	2016	2019*	47
Priority 5	School buildings constructed between 1967 and 1979 with secondary students	2017*	2019*	18
Priority 6	School buildings constructed before 1950 with elementary students	2017*	2021*	159
Priority 7	School buildings constructed before 1950 with secondary students	2020*	2021*	59

Vermont can also look to the example of NYC when considering how long a reasonable remediation might be. At the beginning of its light ballast replacement program, NYC put forward a list of schools that would be fast-tracked, or remediated as quickly as possible. New York Lawyers for the Public Interest kept a spreadsheet of the status of each school until they stopped updating it in April of 2013, leaving us with a snapshot of progress in NYC approximately two years after the city announced its plan in February of 2011 (Figure 1).[147; 148] While many fast-tracked schools completed their replacements, many more were still in the process or had not even started. There are a few critical differences that make it hard to generalize this data. Light ballasts are considerably easier to remediate than caulk and require less specialization, though they still require much of the same site preparation, cleaning as caulk remediation. On the other hand, NYC is more populated than Vermont and likely has more contractors available. Regardless, these data are somewhat useful to see how such a program progresses. Eventually, New York Lawyers for the Public Interest pursued legal action to shorten the ten-year timeline, and NYC was still able to remediate all 883 schools by 2018.[149]

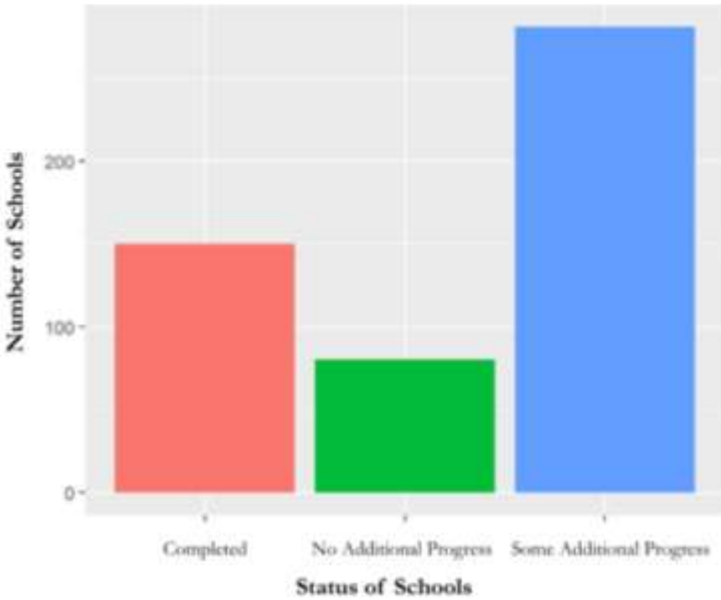

Figure 6.3.1. *Progress of 511 fast-tracked schools approximately two years after light ballast remediation program began. Five schools had no available details. See 147 for full data.*

With respect to caulk remediation, the NYC research again found that a set of best management practices (BMP) was more effective at reducing airborne levels than any of the standard remediation methods.[150] Building materials like caulk are the greatest threat, as they off-gas and produce dust when they deteriorate. As a result, there are three key elements to the NYC list of BMP. First, building managers must perform quarterly inspections to ensure the integrity of the caulking and track any potential changes, with all the inspection documents permanently stored (see Appendix 9.5). Second, if deterioration is identified, the Division of School Facilities (DSF) in the NYC Department of Education must be called to remediate with an EPA-approved method. Under this system, the DSF can select a method that best fits the site while maintaining oversight from the EPA. Despite its shortcomings as a long-term solution, the BMP state that encapsulation is effective as a low-skill, temporary fix before other specialized contractors are available. Further, plumbers, electricians, and other workers can get help from the DSF before potentially disturbing PCBs. Third, the BMP give requirements for regular building hygiene, including wiping up dust and maintaining safe ventilation. The BMP give specific recommendations on using wet mops/rags that pick-up dust, and targeting spaces that produce harmful dust (e.g. heating elements) or absorb lots of particles (e.g. flooring). The building manager must also keep all ventilation and HVAC systems clean and maintain air exchange such that airborne PCBs get cycled outside the building. They must record ventilation maintenance in a logbook.

6.4 PUBLIC OPINION

The issue first came to public salience when a small group of parents brought test results to the City of New York and the press in 2008.[151] When the issue of PCBs first emerged, it was unknown and frightening, so it commanded a lot of public attention. There was press coverage from major outlets like the New York Times and New York Daily News.[152; 153; 154] In response to concerns, NYC first proposed a pilot study and twenty-year timeframe for remediation, which elicited outrage from concerned parents and brought non-profits like New York Lawyers for the Public Interest (NYLPI) into the fold. Even as the initial fear and outrage subsided, NYLPI and news outlets continued to press the issue until NYC and the EPA cemented the pilot study and ten-year timeline. While the pilot-study was well-received, the ten-year timeline was still considered unreasonable, because most students who were in public schools at the time would never experience the improvement.[155] There were protests, and many public interest groups and politicians became involved.[156] Unions like the United Federation of Teachers also advocated for the health of teachers. [157] Finally, litigation from NYLPI and New York Communities for Change shortened the timeline such that all schools were remediated by 2016, five years after the program launched.[158]

Over the course of the program, NYC learned several lessons regarding risk communication strategy and transparency. Beyond announcing their plans for testing and remediation, each school sent letters home with children to announce when and how the building would be remediated. Parents also received fact sheets in multiple languages to describe the impact of PCBs, results of the pilot study, and remediation techniques.[159; 160] Because of the involvement of the EPA in the program, there was also a Citizen's Participation Plan that pressed for improved science communication, transparency, and involvement in public meetings.[161] Though some public meetings were sparsely attended, the CPP attempted to make them more accessible by notifying the community more broadly and further ahead of time. Transparency during every part of the process was an important element of the risk communication strategy, and a perceived lack of transparency early in the program created lots of public fear and outrage.

7 RECOMMENDATIONS

Emerging research suggests that attending or working in contaminated schools represents the worst case for exposure to PCBs.[162] The myriad health effects explored in existing research demonstrate that schools should continue testing for and remediating PCBs to minimize child and teacher exposure. In addition, continued monitoring of emerging research, specifically research focusing on health effects linked with airborne PCBs, is still needed to ensure that policies continue to align with the scientific landscape, as findings continue to emerge regarding the health effects of airborne, LC, and NDL PCBs.

In terms of testing, we recommend a continuation of the current system of air testing in Vermont, with an emphasis on the high-risk spaces identified in NYC, like south-facing walls, as well as collecting a breadth of data across different times and conditions. To make this goal more practical, we recommend further exploring passive sampling methods that could be cheaper and less disruptive.

Considering PCB remediation options and the NYC Case Study, we recommend implementing a system of best management practices for all schools that likely have PCBs in building materials. For an example of the EPA-approved best management practices from the New York City program, see Appendix 9.5. In rooms where air testing shows unsafe airborne PCB levels, we recommend identifying high-risk materials such as deteriorating caulk, followed by both removal and encapsulation, since using only one of these strategies is ineffective. Encapsulation can be used as a short-term solution if contractor work is unavailable.

In terms of funding, we recommend considering increasing the reimbursable cost of mitigation within the 80/20 cost share from $500,000 to a higher value, as mitigation costs will likely be higher. Our school action analysis demonstrated that PCB remediation can easily exceed millions of dollars.

Placing the burden of this cost on schools—particularly less-resourced schools—will result in major budget deficits and a potential need to cut school activities. To obtain more funding, we also recommend considering possible litigation against Monsanto, as New Hampshire government was able to settle with Monsanto in court due to PCBs in their waterways.

In connection with all these goals, we recommend creating a citizen participation plan that provides for accessible public meetings with sufficient notification, allows for public comment, and sends information back to each family regarding their school's plan. We also recommend a risk communication strategy to clarify the risks of PCBs and avoid public confusion and fear.

8 CONCLUSION

Although it is apparent that elevated levels of PCBs can be dangerous to the health of all, especially that of children, further research is still needed to understand the broader health effects of long-term exposure to PCBs. Moreover, even with the knowledge of the New York City program, there is no singular approach to remediation: every situation is case-by-case. Thus, PCBs are a complex issue with not many clear answers.

Furthermore, decisions to remediate and test must weigh both the wellbeing of students and the role of schools. PCBs undeniably negatively affect student and teacher health, but remediation may also lead to schools operating in limited capacity, whether due to budget cuts or closed rooms. Even after the removal of PCBs, diligent mitigation practices are necessary to further remove PCBs from the air. Minimizing both the risk of PCBs and disruption to the school day is thus important. Nonetheless, PCBs due to their prominence in building materials will likely be a persistent problem throughout the country for decades. Vermont, as the first state to require school testing and remediation, must keep these trade-offs in mind as the testing program continues.

9 APPENDIX

9.1 LIST OF INTERVIEWS AND CORRESPONDENCE

1. Dr. Robert Herrick, expert on occupational exposures (Harvard School of Public Health), interviewed on December 15, 2022.
2. Dr. Keri Hornbuckle, director (University of Iowa Superfund Program), interviewed on December 19, 2022.
3. Dr. Hans Lehmler, neurotoxicologist (Superfund Program), interviewed on December 20, 2022.
4. Dr. Rachel Marek, inhalation exposure researcher (Superfund Program), interviewed on December 20, 2022.
5. Patricia Coppolino, Senior Environmental Program Manager (Vermont Department of Environmental Conservation), interviewed on December 22, 2022.
6. Dr. Daniel Lefkowitz, interviewed on December 22, 2022.
7. Dr. Sarah Vose, Vermont State Toxicologist (Vermont Department of Health), interviewed on January 6, 2023.
8. Matt Brouilette, Director of Facilities (Grand Isle Supervisory Union), interviewed on January 19, 2023.
9. Jamie Kinnarney, Superintendent of Schools (White River Valley Supervisory Union), interviewed on January 31, 2023.
10. Jeffery Francis, Executive Director (Vermont Superintendents Association), interviewed on January 11, 2023 and February 22, 2023.
11. Mark Tucker, Superintendent of Schools (Caledonia Central Supervisory Union), interviewed on January 9, 2023.
12. Tom Flanagan, Superintendent of Schools (Burlington School District), interviewed on January 17, 2023.
13. Jay Nichols, Executive Director (Vermont Principals Association), interviewed on January 26, 2023.
14. Elaine Collins, Superintendent of Schools (North Country Supervisory Union), interviewed on February 17, 2023.
15. Karen Horn, Director of Public Policy & Advocacy (Vermont League of Cities and Towns), emailed on January 10, 2023.
16. Mark Liberman, Reporter (EdWeek), emailed on December 15, 2022.
17. Jeff Hamel, NNE Regional Manager (Woodard & Curran), interviewed on January 30, 2023.
18. Bree Carlson, Associate Director of Environmental Health and Safety Compliance and Fire Safety (Dartmouth College), interviewed on January 17, 2023
19. Jeff Buel, Public Relations Manager (Efficiency Vermont), emailed on December 27, 2022.
20. Dr. James Haklar, Environmental Engineer, Assistant to the Regional Public Liaison (EPA), interviewed on January 12, 2023.
21. Steve Ferreira, Region 2 - PCB Coordinator in Charge of Remediation (EPA), interviewed on January 12, 2023.
22. Gary Hunt, Vice President, Principal Scientist (TRC Companies, Inc.), interviewed January 25, 2023.
23. Christina Giorgio, Attorney, interviewed February 7, 2023.

9.2 ANALYSIS OF SCHOOL ACTION IN U.S. MATERIALS

9.2.1 LIST OF SCHOOLS IN ANALYSIS

1. Mildred Strang Middle School
2. French Hill Elementary School
3. Mohansic Elementary School
4. Benjamin Franklin Elementary School
5. Westport Middle School
6. John F. Kennedy Middle School
7. Estabrook Elementary School
8. Burke Elementary School
9. Malibu High School
10. Juan Cabrillo Elementary School
11. Colonia High School
12. Sky Valley Education Center

9.2.2 CHART FOR SCHOOL ACTION ANALYSIS

Remediated Schools	Date Initial Test (approx.)?	Date Final Remediation (approx.)?	Location?	Cost of Remediation (approx.)?	Closure?	Funded?	Litigation?	Demolished?
Mildred Strang Middle School	2011	2019	Yorktown Heights, NY	Not easily publicly avail.	NO	Local	NO	NO
French Hill Elementary School	2005	2012	Yorktown Heights, NY	$153,563	YES	Local, Litigation	YES	NO
Mohansic Elementary School	2010	2014	Yorktown Heights, NY	Not easily publicly avail.	NO	Local	NO	NO
Benjamin Franklin Elementary School	2008	2011	Lakeland, NY	$14,000	Partial (summer camp relocated)	Local	NO	NO
Westport Middle School	2011	2021	Westport, MA	$97.3 million	YES	Local, State	YES	YES
John F. Kennedy Middle School	2017	~2018	Enfield, CT	$45,000 management plan	NO	Local	NO	NO
Estabrook Elementary School	2010	2014	Lexington, MA	$43 million	YES	Local, State	YES	YES
Burke Elementary School	2011	2012	Peabody, MA	Not easily publicly avail.	NO	Local	NO	NO
Malibu High School	2011	Expected 2024	Malibu, CA	$195 million within school district	YES	Local	NO	YES
Juan Cabrillo Elementary School	2011	Expected 2024	Malibu, CA	$195 million within school district	YES	Local	YES	NO
Colonia High School	2022	ONGOING	Woodbridge, NJ	ONGOING	ONGOING	ONGOING	NO	NO
Sky Valley Education Center	2016	2021	Monroe, WA	Not easily publicly avail.	YES	Local, State	YES	NO

9.3 CURRENT STATE OF LIGHT BALLASTS IN VT SCHOOLS

The Green Lights Program of 1995 replaced many light ballasts in Vermont with energy efficient lights. Moreover, according to Efficiency Vermont, a light ballast on average lasts fifty years, and thus it is possible that there could be some relatively low-use fixtures from before 1978 that still have PCB-containing ballasts. Burlington High School did find PCB-containing light ballasts in their school. According to Vermont guidelines, school officials are supposed to check for PCB-containing light ballasts prior to PCB testing.

9.4 FEDERAL REGULATIONS AND STANDARDS

On a federal level, there is no nationwide law that mandates testing, nor reporting of testing, for PCBs in schools or buildings. Although there is no requirement to test, buildings built or renovated between 1960 to 1973 tend to be the most likely to have PCBs in building materials. It is common practice for buildings in this category to test for PCBs during renovations. Nonetheless, some building managers are hesitant to test, as it is not a federal law and they do not want to incur the high cost of remediation. This is so because the federal regulation operates that once elevated levels of PCBs are discovered, then the building must be remediated for PCBs and follow the federal cleanup protocol. Similarly, in schools nationwide, once PCB testing exceeds the EPA limit, which for schools is approximately 100-200 ng/mg^3 for Pre-K classrooms, 300 ng/mg^3 for K-6th grade classrooms, and 500-600 ng/mg^3 for 7th grade classrooms and above,[163] further testing, a remediation plan, and a disposal plan is required by federal law.

9.5 SAMPLE BEST MANAGEMENT PRACTICES FORM

NEW YORK CITY DEPARTMENT OF EDUCATION
DIVISION OF SCHOOL FACILTIES
ANNUAL SUMMARY OF QUARTERLY INTERIOR CAULK INSPECTION FORM

BUILDING CODE: ________ **ISC/DISTRICT:** ____________ **YEAR BUILT:** __________

QUARTER	DATE/INSPECTED BY (i.e. MM/DD/YYYY; Name/Title)	LOCATION/AREA (i.e. Room Number, Window Wall, Door frame)	DEFICIENCIES NOTED (i.e. Missing or Damaged Caulk)	NOTIFICATION MADE (i.e. Date, P.P. Work Request Number)	STATUS (i.e. Pending, In Progress or Complete)
Initial Inspection					
1st (Jan, Feb, March)					
2nd (April, May, June)					
3rd (July, Aug, Sept)					
4th (Oct, Nov, Dec)					

Completed by: ______________________ **Title:** ______________________ **Date:** ________________

FORM - Quarterly Interior Caulk Inspection Form_Feb2010

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