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UNITED STATES DISTRICT COURT

CENTRAL DISTRICT OF CALIFORNIA

WESTERN DIVISION

AMERICA UNITES FOR KIDS, et al., Plaintiffs, vs. SANDRA LYON, et al, Defendants.	No. 2:15-CV-02124-PA-AJW Judge: Anderson Dept.: 15 SUPPLEMENTAL DECLARATION OF DOUGLAS DAUGHERTY IN SUPPORT OF DEFENDANTS' OPPOSITION TO PLAINTIFFS' MOTION FOR INJUNCTIVE RELIEF Complaint filed: March 23, 2015

SUPPLEMENTAL DECLARATION OF DOUGLAS DAUGHERTY

I, DOUGLAS DAUGHERTY, hereby declare as follows:

1. This supplemental declaration is submitted in support of Defendants' Opposition to Plaintiffs' Motion for Preliminary Injunctive Relief. This declaration is intended to supplement my initial declaration signed on April 2, 2015 ("First Daugherty Declaration"), which contains a summary of ENVIRON's qualifications and ENVIRON's opinions in support of the Defendants' opposition to the application for expedited discovery. Many of those same opinions similarly support the Defendants' Opposition to Plaintiffs' Motion for Preliminary Injunctive Relief and are therefore incorporated herein by reference. Unless otherwise stated, I have personal knowledge of the facts set forth herein and, if called to testify, I could and would testify competently thereto.

II. The District Has a Plan Approved by EPA Based on EPA's Regulations and Guidance for PCBs under TSCA; Revisions to the Plan Would Require Time to Achieve EPA Concurrence and Approval.

2. In his March 31, 2015 declaration, Plaintiffs' expert, Dr. Rosenfeld, asserts that there is an immediate need for comprehensive testing and removal of building materials containing PCBs. However, Dr. Rosenfeld does not offer an analysis explaining why testing needs to be expanded to other building materials or why remediation needs to occur on an expedited schedule.

3. As discussed in Section IV of the First Daugherty Declaration, the Santa Monica-Malibu Unified School District ("SMMUSD" or "District") has developed plans for managing the potential health risks associated with PCB-impacted building materials. Specifically, this includes a Site-Specific PCB-Related Building Materials Management, Characterization and

Remediation Plan for the Library and Building E Rooms 1, 5, and 8 at Malibu High School ("Site-Specific Plan") as well as a Supplemental Removal Information ("Supplement") for Malibu High School (MHS) and Juan Cabrillo Elementary School (JCES). True and correct copies of these plans were attached to the First Daugherty Declaration as Exhibit G and Exhibit H, respectively. The Site Specific Plan and Supplement identify caulk with a verified PCB concentration of 50 parts per million ("ppm") or greater that is to be remediated based on bulk testing. In addition, the plan outlines a process for managing the caulk in place through use of EPA-approved Best Management Practices ("BMPs") until the caulk is removed as well as until removal of any porous, underlying substrate during the next planned renovation or demolition. Under its jurisdiction for matters related to the Toxic Substances Control Act ("TSCA"), EPA concurred with the District's methods and approved the District plan in two letters to the District, sent on August 14, 2014 and October 31, 2014, respectively. A true and correct copy of EPA's August 2014 and October 2014 approvals were attached to the First Daugherty Declaration as Exhibit F and Exhibit C, respectively.

4. As described in the Supplement, rooms identified in the Supplement that contain caulk with verified PCB concentrations of 50 ppm or greater —which includes MHS Library, Building E Rooms 1, 5, and 8 and Building G Room 506—will be remediated by June 30, 2015. Additional rooms containing caulk with verified PCB concentrations of 50 ppm or greater, as identified in ENVIRON's March 20, 2015 notification letter to EPA (First Daugherty Declaration Exhibit J), will be remediated by March 20, 2016, which is within one year following identification and verification of the caulk with elevated PCB concentrations. The District plans to remediate as many of these locations as possible over the summer 2015 school break. Until removal

of the caulk, as endorsed by EPA at this site and reflected in EPA policy, the District will continue to implement BMPs and conduct periodic air and surface wipe sampling to ensure that conditions remain safe, pursuant to EPA's approval.

5. During a Study Session before the SMMUSD Board of Education on December 12, 2013—during which EPA Region IX and the California Department of Toxic Substances Control answered board member questions regarding environmental activities at MHS and JCES—EPA made several statements reinforcing their risk-based approach for managing PCBs in place with BMPs. The Board's Minutes for the Study Session state: "EPA was able to draw some conclusions, specifically that the air samples were well within the EPA's acceptable health risk-based range for schools and that it was safe for staff and students to return to the classrooms….Mr. Armann [of the EPA] assured everyone that it was safe for the classrooms to be occupied." A true and correct copy of the Study Session Minutes is attached hereto as Exhibit 1.

6. During the December 2013 Study Session, EPA Region IX Senior Regional Toxicologist Patrick Wilson explained that: "The 50 parts per million is a part per million measurement for the concentration of PCBs in caulk. It's a regulatory trigger. It's not based upon health impacts, or the potential for PCBs in caulk to generate an adverse health effect." *See* December 12, 2013 Board of Education Session, http://santamonica.granicus.com/MediaPlayer.php?view_id=5&clip_id=3174, at1:31:00-1:31:20. A CD with excerpts of the Study Session referenced herein will be filed separately with the Court along with a Notice of Lodging.

7. EPA Region IX PCB Coordinator Steve Armann and Department of Toxic Substances Control Schools Unit Branch Chief Thomas Cota both assured the Malibu community that they would be comfortable sending their

own children to the Malibu schools. Mr. Cota said: "Based upon our review of the data, I don't think there is a problem sending a child to school, and I would send our daughter to the school, no questions asked." *See* December 12, 2013 Board of Education Session, at 2:10:05-2:10:19.

8. EPA has also declared that PCB-containing materials remaining in the school buildings until renovation or demolition meets TSCA's no unreasonable risk requirement. EPA's October 31, 2014 approval (First Daugherty Declaration Exhibit C) states: "An approval under TSCA regulations in 40 C.F.R. 761.61(c) requires EPA to make a finding that PCB remediation wastes remaining in place at the two schools will not pose an unreasonable risk of injury to health or the environment. EPA is hereby making a finding that the District meets this TSCA standard for Malibu High School and Juan Cabrillo Elementary School."

9. As stated in EPA's October 2014 approval: "Overall, the sampling data from the two schools demonstrate that these PCB exposure pathways are currently being addressed by the District's BMPs in a manner that protects public health. Thus, the District's undertaking of Best Management Practices (BMPs), as verified by pre- and post-BMP sampling data, demonstrate that the TSCA standard for no unreasonable risk is currently being met at MHS and JCES."

10. EPA's October 2014 approval also stated: "Based on the continuous implementation of the BMP program in conjunction with the District's planned removal of PCB-containing caulk and the measures in this approval, EPA has determined that conditions at the school will continue to protect public health and meet the TSCA standard until the building components covered by this approval are removed during school renovation or demolition."

11. The District is bound by the terms of the current EPA approvals. Any changes require consultation with and the express written consent of EPA, as, per the October 2014 approval, "[d]eparture from this approval without prior written permission from EPA may result in revocation of this approval." If the District were to implement the plan suggested by Dr. Rosenfeld, expanding testing beyond the approvals to include other materials in addition to caulk and changing the approved timeframes for remediation, the District would need to go through another process to ensure those changes obtain EPA concurrence and/or approval. Such an approval process would require additional time, potentially delaying remediation past the time that it is already set to occur during the summer 2015 school break. Given that EPA has already confirmed that the BMP program and planned removal activities will protect public health at the schools, disregarding EPA's existing approval to engage in yet another approval process is unwarranted.

III. Plaintiffs Offer No Evidence of Irreparable Harm if Removal Occurs on the EPA-Approved Timetable as Opposed to When Plaintiffs Request.

12. Plaintiffs have advocated for expedited testing and removal of caulk on the basis that conditions at the schools are causing irreparable harm to students and staff. However, there is no evidence to support this claim, and the environmental data collected to date at MHS and JCES actually indicate that exposure levels are acceptable and the schools are safe as confirmed by EPA.

13. In his declaration, Dr. Rosenfeld advocates for immediate testing and removal of caulk containing PCBs because PCBs accumulate in the body over time, and therefore could potentially lead to adverse health effects for students and staff. However, Dr. Rosenfeld provides no data or calculations demonstrating any accumulation of PCBs in populations (i.e., student, staff) at

MHS and JCES due to the presence of PCBs at the two schools; nor does he show that the PCBs are present at MHS and JCES at levels that represent the potential for adverse health outcomes. Finally, Dr. Rosenfeld does not explain how the typical school populations are regularly exposed to PCBs in caulking that is largely located at the window and outer door frames at the school buildings. A complete exposure pathway must be present for inhalation, ingestion, or dermal absorption of the contaminants to occur.

14. PCB accumulation in the human body such that adverse health effects could result occurs over many years, and elevated short-term levels, even if they exceed EPA's PCB health protective benchmarks for schools (which is not the case at MHS and JCES as measured levels are below the benchmarks), are not a cause for concern. As stated by EPA in its "PCBs in Caulk – Q & A" document, "It should be recognized that exceeding EPA's levels for a school exposure does not mean that adverse effects will necessarily occur. Because PCBs accumulate over such long averaging times, short term exceedances of the levels will likely cause only small changes to human blood concentrations, and these can be offset by other periods of exposure to lower air levels." A true and correct copy of relevant excerpts from the EPA "PCBs in Caulk – Q & A" document is attached hereto as Exhibit 2.

15. Since PCB levels that students and staff could potentially be exposed to are consistently below EPA's PCB health-protective benchmarks for schools, it is not reasonable to conclude that such exposures are causing any adverse effects or "irreparable harm". Furthermore, because remediation of all identified and verified PCB exceedances of the TSCA threshold at the schools must occur by March 2016 pursuant to EPA's approval, the schedule that Plaintiffs request, in the best-case scenario, would only result in a completion of remediation seven months earlier than required. Even if there were elevated

PCB exposures at the schools, which there are not, because short-term exposures to elevated PCB concentrations are offset over a lifetime, there is no evidence that there would be any health risk to students and staff from adhering to the current EPA approved remediation schedule rather than the schedule Plaintiffs request.

IV. The Air and Surface Wipe Thresholds for PCBs in Schools Employed by EPA at the Schools are Appropriate.

16. EPA's health-protective benchmarks for PCBs in schools (discussed in Section III of the First Daugherty Declaration) are highly conservative and account for accumulation of PCBs through diet and other background sources including school air. Because the PCB concentrations in air and wipe samples collected from MHS and JCES are below these protective concentrations, no adverse health effects would be expected.

17. As air and surface wipe sampling results at MHS and JCES satisfy EPA's PCB health protective benchmarks for schools, with most results not detected above the laboratory's reporting limit, EPA believes exposure levels are acceptable and the schools are safe.

18. The air sampling data at MHS and JCES indicates that air concentrations are significantly below available permissible exposure limits (PELs) for PCB Aroclors 1242 and 1254 established by the California Division of Occupational Safety and Health (better known as Cal/OSHA) for the protection of workers. The Cal/OSHA 8-hour time-weighted average (TWA) PEL for Aroclor 1242 and Aroclor 1254 are 1 milligram per cubic meter (mg/m^3) and 0.5 mg/m^3, respectively (i.e., 1,000,000 ng/m^3 to 500,000 ng/m^3), which are more than roughly 1,000 to 2,000 times higher permissible values than the EPA Public Health Levels for PCBs in Indoor School Air for teachers and staff of 450 ng/m^3. A true and correct copy of the Cal/OSHA PELs is

attached hereto as Exhibit 3. A true and correct copy of the EPA Public Health Levels for PCBs in Indoor School Air was attached to the First Daugherty Declaration as Exhibit B.

19. Plaintiffs rely on airborne values not applicable to the school populations at MHS and JCES to argue that caulk should be tested and removed. EPA's PCB benchmarks for air and surface wipes are health-protective, and alternative benchmarks proposed by Plaintiffs are not justified at these schools. EPA's health benchmarks were derived based on noncancer endpoints but are set at levels that are also protective against cancer endpoints. These benchmarks are not arbitrary, but were developed following standard health risk assessment methodology and integrate toxicological and epidemiological data on PCBs.

20. Although EPA Region IX initially required PCBs in air to be compared against a guideline of 200 ng/m^3(or 100 ng/m^3 for children ages 3 to less than 6 years old), after consideration within an EPA national working group on PCBs in schools, EPA Region IX determined it would be more appropriate to use the school-specific Public Health Levels applied nationwide that range from 100 ng/m^3 for children under the ages of 3 to 6 to 600 ng/m^3 for teens as depicted in Exhibit B to the First Daugherty Declaration.

21. PCBs are a mixture of compounds called congeners. EPA's Public Health Levels for PCBs in Indoor School Air take individual congener toxicity into account, so evaluating concentrations of specific congeners, such as congener 126 which is singled out in both the Rosenfeld and DeNicola Declarations, is not relevant. The public health levels are based on toxicity studies in animals exposed to mixtures of the PCB congeners called Aroclors. The Aroclors in these studies contained the congeners that are of a health risk

concern. Thus, risk estimates for Aroclors also take into account the congeners of concern, including congener 126 in the measured applicable Aroclors.

22. The alternative benchmarks cited in the DeNicola Declaration are also not appropriate. The value of 4.2[1] ng/m^3 cited in the DeNicola Declaration, which is a regional screening level for PCBs in **residential** air, is not an appropriate value for comparison to school populations. Instead, it represents the screening level for PCBs in residential air and is based on residential exposure assuming 24 hours per day, 350 days per year, for 26 years and a 1 in a million cancer risk. The exposure time for residents is much longer than the exposure time for school populations so is not appropriate for school populations. EPA Region IX Senior Regional Toxicologist Patrick Wilson explained this during the December 2013 Study Session: "Our residential exposure scenario assumes an exposure of 30 years, 350 days a year, 24 hours a day. So that's practically continuous exposure. If you accept the premise that exposure is proportionate to risk, your risk is bound to be higher in a residential scenario because your exposure is higher." *See* December 12, 2013 Board of Education Study Session, at1:27:39-1:33:50. A true and correct copy of EPA Screening Levels for PCBs in Residential Air is attached hereto as Exhibit 4.

23. Furthermore, residential screening levels (SLs) are identified by EPA as "chemical-specific concentrations for individual contaminants in air, drinking water and soil that may warrant further investigation or site cleanup. It should be emphasized that SLs are not cleanup standards." See EPA User Guide for Regional Screening Level Tables (November 2014), available at

1 The current regional screening level value for PCBs is 4.9 ng/m^3 (January 2015); this is presumably what the DeNicola Declaration is referring to in her declaration.

http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/usersguide.htm. Thus, these values are not cleanup standards and exceeding these standards does not imply an adverse effect will occur. A true and correct copy of EPA's User Guide for Regional Screening Level Tables is attached hereto as Exhibit 5.

24. The benchmarks for PCBs in air proposed by Mark Katchen of the Phylmar Group of 20.3 ng/m^3 (students) and 63.7 ng/m^3 (teachers) are also discussed in the DeNicola Declaration but they are also inconsistent with EPA's methodology for setting public health levels for PCBs in school air. The EPA Public Health Levels for PCBs in School Air are the appropriate levels to apply at the Malibu schools as they recognize the special exposure setting and concerns regarding PCBs in school air, consider exposure to PCBs in background sources, and are set to be protective of both cancer and non-cancer endpoints as depicted in Exhibit B to the First Daugherty Declaration. Concentrations at or below these Public Health Levels represent the amount of PCB average exposure over the school year that "EPA does not believe will cause harm".

V. There is No Evidence PCBs at the Schools are Linked to Cancer.

25. Beyond the specific values cited in the DeNicola and Rosenfeld Declarations, Plaintiffs provided the Lambert and Leonard Declarations, which state that Ms. Lambert and Ms. Leonard believe their thyroid cancers are linked to their potential PCB exposures at the schools. The Lambert and Leonard Declarations present no evidence to support these conclusions, and there is significant literature suggesting there is no link between PCBs and thyroid cancer.

26. Because exposure levels at the schools are so low, PCB exposures in the schools would not be expected to cause any adverse effects.

Studies showing cancer effects of PCBs in laboratory animals involved significantly higher exposures than those in the school setting. In fact, while EPA, and the California Office of Environmental Health and Hazard Assessment ("OEHHA") have concluded it is likely PCBs are carcinogenic in humans based on clear evidence of carcinogenicity in animals, studies of people exposed to high levels of PCBs in the workplace or in accidental exposures have not shown a consistent increase in cancer. *See* EPA Integrated Risk Information System, Polychlorinated Biphenyls, available at http://www.epa.gov/iris/subst/0294.htm; OEHHA, PCBs in Fish Caught in California: Information for People Who Eat Fish, available at http://oehha.ca.gov/fish/pcb/. A true and correct copy of EPA's IRIS Profile of PCBs is attached hereto as Exhibit 6. A true and correct copy of OEHHA's study PCBs in Fish Caught in California: Information for People Who Eat Fish is attached hereto as Exhibit 7.

27. In response to concerns about thyroid cancers in Malibu, the Los Angeles Department of Public Health ("DPH") conducted an evaluation of thyroid cancer in SMMUSD and concluded that "DPH does not find evidence of unusual cancer rates or occurrences at Malibu." A true and correct copy of the DPH evaluation is attached hereto as Exhibit 8. Los Angeles DPH notes that within "thyroid cancer" there are many variants: papillary, follicular, medullary, and anaplastic. Background cancer risks are about 1 in 2 for men and 1 in 3 for women. *See* American Cancer Society, Lifetime Risk from Developing or Dying from Cancer (2013), available at http://www.cancer.org/cancer/cancerbasics/lifetime-probability-of-developing-or-dying-from-cancer. A true and correct copy of the American Cancer Society's webpage on lifetime cancer risks is attached hereto as Exhibit 9.

28. The American Cancer Society indicates that low iodine, radiation exposure, and family history of thyroid cancers are all risk factors for thyroid cancer. The Los Angeles DPH identified additional risk factors for thyroid cancer including obesity, history of thyroid conditions: goiter, benign thyroid nodules/adenomas, thyroiditis/Hashimoto's thyroiditis, and Cowden disease. The American Cancer Society indicates that women have about a 1 in 63 lifetime risk for thyroid cancer while men's risk is about 1 in 183. *See* American Cancer Society, Thyroid Cancer (2013), available at http://www.cancer.org/cancer/thyroidcancer/index. For comparison, regulatory risk levels are set with an upper end at 1 in 10,000. A true and correct copy of the American Cancer Society's thyroid cancer webpage is attached hereto as Exhibit 10.

29. A recent study in South Korea conducted by Ahn et al. suggested that the apparent increase in thyroid cancer in South Korea was related to increased screening and diagnosis. The authors' research indicated that similar increases in diagnosis rates were identified in many countries, including the United States. Despite this increased diagnosis rate, there was no increase in mortality from thyroid cancer. The increase in thyroid cancer detection reflects more intensive cancer screening which can detect cancers, such as small papillary thyroid cancers, that otherwise likely would never have been apparent during the person's lifetime. A true and correct copy of the Ahn et al. report is attached hereto as Exhibit 11.

VI. The Schools Are Following an Approach Consistent with EPA National Guidance.

30. Plaintiffs advocate for caulk testing and removal, even though it is EPA's recommendation that caulk testing and removal only occur if air or wipe sampling data shows continual exceedance of EPA's Public Health Levels

for PCBs in Indoor School Air. During the December 2013 Study Session, EPA Region IX PCB Program Coordinator Steve Armann stated: "And if you look at our guidance, our recommendation is: test the air. If you've got safe air, or if you're within our standards, that's fine." *See* December 12, 2013 Board of Education Session, at1:33:35-1:33:55. EPA memorialized this policy in its August 2014 approval: "EPA does not recommend additional testing of caulk unless dust or air samples persistently fail to meet EPA's health-based guidelines." After any plan-triggered cleaning, all surface dust wipe samples but those in the MHS woodshop were below EPA's PCB health protective benchmarks for schools (see Section VIII for additional details), and the air sampling data at MHS and JCES are also below EPA Public Health Levels for PCBs in Indoor School Air[2,3] and well below Cal/OSHA PELs, indicating that exposures at the schools do not pose a risk of adverse health effects.

31. In an April 25, 2014 letter from EPA to Ms. DeNicola (DeNicola Declaration Exhibit 5), EPA clearly outlined its approach to addressing PCBs in schools. According to EPA, "EPA's general strategy to address PCBs in building materials is one of avoiding harmful human exposures." In its letter, EPA cites their fact sheet, Preventing Exposure to PCBs in Caulking Material,

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[2] The one pre-BMP result above EPA's benchmark was in a room where orchestra risers (building materials) were removed just prior to the start of ENVIRON's June through August 2014 investigation even though District Facility's staff had requested that the school and parents not remove these building materials until after the planned summer investigation. It is likely that this activity impacted the results seen in this room as the riser removal resulted in damage to surrounding building materials. Thus, this finding is not typical of conditions in any other rooms at MHS or JCES. The post-repair and post-BMP cleaning sample was below the laboratory detection limit.

[3] All but this one sample were also below the guideline initially suggested by EPA for PCBs in air of 200 ng/m^3 (or 100 ng/m^3 for children ages 3 to less than 6 years old).

which emphasizes their position that bulk testing of building materials should only be conducted if air sampling indicates a potential health concern: "If school administrators and building owners are concerned about exposures to PCBs and wish to supplement these steps, EPA recommends testing to determine if PCB levels in air exceed EPA's suggested public health levels. If testing reveals PCB levels above these levels, schools should attempt to identify any potential sources of PCBs that may be present in the building, including testing samples of caulk and other building materials." EPA reminds Ms. DeNicola that "[they] are not requiring additional caulk testing or removal beyond what the cleanup plan may require unless air samples results are above our suggested public health guidelines…In determining whether PCBs are being improperly used, the current regulations do not require testing of materials to determine if they contain PCBs at TSCA regulated levels."

32. Other states are also following EPA's national guidance to implement BMPs to reduce exposure to PCBs. For example, the State of Washington's Department of Ecology ("DOE") recently published a PCB Chemical Action Plan, which closely follows EPA's national guidance of managing PCBs in place until they can be removed. DOE's Action Plan confirms that TSCA "[d]oes not require testing to find PCB sources," and states that building materials containing PCBs can be managed in place: "Depending on the extent of contamination, schools decide whether to pursue abatement (reducing the amount of PCBs in building materials permanently) or mitigation (controlling exposure) procedures." A true and correct copy of relevant excerpts of the DOE PCB Chemical Action Plan is attached hereto as Exhibit 12.

VII. There are Reliability Issues with America Unites' "Independent" Testing Data.

33. In the Rosenfeld Declaration, Dr. Rosenfeld bases his opinion on the immediate need for caulk and building material testing and removal (which is contrary to EPA's recommended approach described in Section V of this declaration) on caulk test results collected by America Unites. Dr. Rosenfeld states that "I am not aware of any scientifically valid reason to accept the test results commissioned by the District, but not those commissioned by America Unites." However, Dr. Rosenfeld provides no evidence that he scientifically reviewed the information to determine if it is suitable to be part of a scientific study necessary to obtain EPA approval.

34. ENVIRON has undertaken a detailed analysis of the reliability of America Unites' "independent" data. A true and correct copy of ENVIRON's analysis is attached hereto as Exhibit 13. ENVIRON has identified numerous reasons why the America Unites data are not reliable, such as inadequate documentation (e.g., incomplete location descriptions), failure to follow holding time and preservation procedures, and matrix interference. Some of these issues are described in Plaintiffs' validation report cited by the Dinerstein Declaration (Dinerstein Exhibit 13).

35. In addition, the District made multiple requests for missing information related to the American Unites testing, but Plaintiffs' response to these requests (Dinerstein Exhibit 9) did not contain the information requested and essentially stated that the information was already provided. There are uncertainties regarding the America Unites sampling locations in the reportedly sampled rooms due to gaps and missing information in America Unites provided documents to date as well as ENVIRON's observation that there are multiple areas of missing (or gaps in the) caulking in most rooms reportedly sampled, as described in Section V of the First Daugherty Declaration. Without the further information requested, this data could not be used as a

scientific basis for an assessment submitted for EPA review and approval/concurrence.

VIII. ENVIRON's Testing Data Is Reliable and Identified and Verified Caulk above 50 ppm of PCBs is Being Addressed.

36. Due to the unreliability of the American Unites data, ENVIRON conducted its own scientific assessment and identified and verified total PCB concentrations in all bulk caulk samples collected on its February 28, 2015 investigation that exceeded 50 ppm in MHS Building E, Rooms 3 and 7; MHS Building G, Room 505; MHS Building I, Room 401; MHS Building J, Room 704; and JCES Building F Rooms 18, 19, 22, and 23 and notified EPA in accordance with the October 2014 EPA TSCA Approval (First Daugherty Declaration Exhibit C).

37. Contrary to Dr. Rosenfeld's assertion that the District has no plans to remove caulk containing PCBs in excess of 50 ppm in the rooms tested by PEER and AU, ENVIRON-identified and -verified exceedances in MHS Building E, Rooms 3 and 7; MHS Building G, Room 505; MHS Building I, Room 401; MHS Building J, Room 704; and JCES Building F Rooms 18, 19, 22, and 23 that will be addressed within one year of validation of the sampling results pursuant to the October 2014 EPA TSCA approval, unless EPA and the District mutually agree upon a different deadline.

38. Plaintiffs have attempted to discredit the District's air and surface dust wipe sampling results by claiming that the District engages in targeted cleaning of the rooms to be sampled. The DeNicola Declaration alleges: "The air and dust testing results are also subject to manipulation by special cleaning and ventilation before the samples are taken." DeNicola Declaration, ¶30. In reality, the District is simply performing the cleaning required in accordance with the EPA-approved Specific Plan. This cleaning is required to occur at

regular intervals, sometimes as frequently as weekly cleaning; more extensive cleanings occur on monthly and annual bases. The District is conducting frequent cleaning as required under the Specific Plan, not conducting cleaning in rooms just before they are sampled to skew results.

39. In addition, the Rosenfeld Declaration alleges: "When rooms tested above the guidelines for PCBs in air and dust, Environ [sic] simply re-cleaned the rooms until a reading below the guidelines could be obtained." Rosenfeld Declaration, ¶41. In fact, re-cleaning of rooms with PCB concentrations that exceed EPA's air or surface wipe PCB health protective benchmarks for schools is part of the EPA-approved Site Specific Plan (First Daugherty Declaration Exhibit G). For example, the Air and Wipe Sampling MHS Pilot Study Sampling Plan, which is Appendix D of the Site Specific Plan, states that "[i]f any of the post-cleaning sample results exceed relevant health-based criteria, the schedule allows for some second round of cleaning and then re-testing."

40. Moreover, a majority of the regularly occupied rooms sampled during the 2014 Summer Break had pre-BMP cleaning air and surface wipe sample results below EPA's benchmarks, indicating exposures were acceptable even **before** implementation of annual BMP cleaning. This includes rooms in all of the buildings at JCES, as well as Building D (100 and 200, Mako Shark), Building E (000, Blue Shark), Building H (Auditorium/Cafeteria), and Building I (400, Leopard Shark) at MHS. A true and correct copy of excerpts of ENVIRON's 2014 report summarizing these results is attached hereto as Exhibit 14.

41. Plaintiffs also claim that ENVIRON's sampling represents a "snapshot" in time, and therefore does not capture potential long-term variability in PCB concentrations. The DeNicola Declaration claims: "Air and

dust testing can only determine what PCBs are there at the time the test is taken and cannot predict what will be there tomorrow, next week or next month." DeNicola Declaration, ¶29. Similarly, Dr. Rosenfeld claims that "any particular test only gives a snapshot that could change substantially from day to day." Rosenfeld Declaration, ¶38. However, the District is not relying on merely one sampling event to determine whether the air in the school buildings meets EPA health risk levels. The District has conducted several rounds of air and surface wipe testing for PCBs at different times of the year, including before and after implementation of BMPs during 2014 summer break and at the 2014/2015 winter break.

42. During the 2014 summer break sampling, 73% of the air samples and 85% of the wipe samples did not even detect PCBs in concentrations above the laboratory reporting limit. During the 2014/2015 winter break sampling, a still greater proportion, 100% of the air samples and 88% of the wipe samples, did not detect PCBs in concentrations above the laboratory reporting limit (First Daugherty Declaration Exhibit I). Where PCBs were even detected in air samples above the reporting limit at all, PCB detections were below EPA's PCB health protective benchmarks for schools.[2] After the plan-triggered cleaning, all surface dust wipe samples but some of those in the MHS woodshop were below EPA's PCB health protective benchmarks for schools. The MHS woodshop is already set to be addressed under the Site Specific plan. Furthermore, the testing conducted by the District was conducted under conditions designed to represent reasonable **worst-case** exposures (e.g., lights on, windows closed, ventilation system turned off). Actual exposures during room occupancy with ventilation would result in even lower PCB concentrations under normal occupancy conditions of the rooms. The District has plans to do additional testing during the upcoming 2015 summer break.

43. To support her claim that ENVIRON's sampling represents a "snapshot" in time, the DeNicola Declaration presents a copy of a slide from a presentation concerning EPA's study of PCBs in a New York City public school (DeNicola Declaration Exhibit 6) . However, there are several reasons why this exhibit is not helpful or representative of the situation at MHS or JCES. First, the concentrations of PCBs in air measured at this New York City school are significantly higher than the concentrations measured at either MHS or JCES, with many of the values above EPA's Public Health Levels for Schools. In addition, the New York City school data shows less variability for the samples with lower PCB concentrations in air. Since the concentration of PCBs in all of the air samples at MHS and JCES were below EPA's Public Health Levels for Schools, and many of the samples were non-detect for PCBs, less variability would be expected at MHS and JCES. Also, in contrast to the New York City sampling, which was taken under normal operating ventilation which can increase variability, the air samples taken at MHS and JCES were collected under very controlled conditions (e.g., lights on, HVAC off, windows closed) designed to minimize variability while capturing a reasonable worst-case exposure scenario.

44. Plaintiffs have advocated for relocating students and staff to portable buildings pending remediation of PCBs in MHS and JCES due to health concerns, but this is contrary to the approach approved by EPA and the exposure data collected to date. EPA, the agency with primary jurisdiction over TSCA matters, has determined that the classrooms at MHS and JCES are safe, as per EPA's August 14, 2014 approval: "The air and dust sampling results serve as the basis for appropriate decisions by the District…including allowing staff and students access to those classrooms that have been shown to meet EPA's health-based guidelines". EPA's October 2014 approval states

that the rooms covered by the District's Specific Plan would continue to be safe until the removal timeframes specified in the EPA approved plan. Based on the reliable environmental data collected to date and reviewed by EPA to make its determinations the schools are safe, moving students and staff to portable buildings is unnecessary.

IX. Other Approaches Involving Sampling And Removal Are Not Justified By Data and Would Result In Costly Remediation Not Warranted Based On Exposure.

45. The DeNicola Declaration asserts: "The District does not have any plan to test caulk similar in kind and age to the caulk that testing has already shown to have excessive levels of PCBs even though a reasonable person would suspect that such similar caulk would have similarly excessive and illegal levels of PCBs." DeNicola Declaration, ¶28. Similarly, the Rosenfeld Declaration claims "the same results should be expected in other rooms with the same construction history." Rosenfeld Declaration, ¶44.

a. However, many of the pre-1981 buildings at MHS and JCES were built at different times in the 1950's and 60's and have had different repairs and renovations over time, and it is not reasonable to assume that the caulk used in one building is the same caulk used or still present in another building.
b. In addition, even buildings built at the same time may have been constructed with different types of caulk, so caulk with PCB concentrations above 50 ppm in one building does not necessarily mean that it will be present in another building.
c. Given the heterogeneity in PCB concentrations in caulk samples (as evident from AU/PEER's sampling), extensive testing would be required to delineate the extent of PCB contamination in caulk.
d. However, EPA has approved the District's plan to manage in place these potential PCB-impacted materials without impacting public health as described in Section IV of the First Daugherty Declaration, so testing is not required.

46. The DeNicola Declaration also claims that "…the cost to remove the caulk around the windows would be $2,500 to $4,000 per room" based on undisclosed emails from "experts with years of experience in PCB remediation" and an assumed 100 linear feet of caulk only around windows. DeNicola Declaration, ¶35.

47. One important factor missing from this assessment of removal costs is how many rooms would require such removal. As shown in ENVIRON's winter 2014/2015 report, in the pre-1981 buildings at MHS and JCES, there are 351 total rooms of which 126 are regularly occupied by students and teachers (Exhibit 15). Using the cost estimate from the DeNicola Declaration, the total costs would be from $877,500 to $1,404,000 for all the rooms or $315,000 to $504,000 for the regularly occupied rooms at both schools. However, Exhibit 9 to the DeNicola Declaration presents estimates for caulk removal ranging from $700,000 to $3,100,000 for a **single school**. Given the evidence attached to the DeNicola Declaration, the DeNicola Declaration's cost assessments for the Malibu schools appear to be inconsistently low.

48. The cost estimate in the DeNicola Declaration is unrealistically low, likely because it 1) uses unsupported data regarding the amount of caulk to be removed and the cost per linear foot to do so, 2) assumes that only caulk around windows requires removal even though there is caulk used at MHS and JCES beyond use around windows (e.g., doors, sinks) and it is well understood in the scientific community that PCBs have been identified in other building materials and the substrate next to some of them (Exhibit 14), and 3) does not include other technical and regulatory compliance activities that would be conducted for such a project under TSCA (e.g., consultant sampling efforts associated with the pre-remedial characterization of PCB-containing caulk and

impacted substrate, encapsulation or removal of contaminated substrate, replacement of removed substrate, remediation oversight, post-remediation verification sampling to ensure the effectiveness of the remediation, and associated record keeping and reporting to EPA) or public participation activities.

49. ENVIRON developed cost estimates for three potential remedial options for PCB-impacted caulk and associated PCB-impacted substrate in MHS and JCES for presentation to the SMMUSD Board of Education on March 19, 2015. A true and correct copy of excerpts of the presentation is attached hereto as Exhibit 16. The cost estimates developed by ENVIRON are referred to herein as Options A, B, and C. ENVIRON incorporated reasonable assumptions in creating each of these cost estimates (e.g., as applicable to the relevant option: the linear footage of caulk in each building; the linear footage of caulk and substrate that would require removal and replacement; the number of pre-remedial caulk samples; the number of verification samples of caulk, air, and surface wipes; the public participation and consulting effort required; and the unit cost for demolition and reconstruction of buildings). Some of the more significant assumptions for each option are described further below.

a. Option A is based on the removal and replacement of all PCB-impacted caulk containing greater than or equal to 50 ppm PCBs, as determined through pre-remedial testing; subsequent encapsulation of the contaminated substrate materials (brick, cement, wallboard, etc. located adjacent to the caulk) using an approved encapsulant; and completion of various concurrent activities that would be required with the pre-remedial testing and remediation (e.g., preparation of a PCB Characterization Summary report, remedial work plan preparation, associated communications and meetings with the public and EPA, and preparation of a PCB Remediation Completion report). This option assumed that 40% to 100% of the caulk in the school buildings would have a PCB concentration that exceeds 50 ppm. ENVIRON used 40% as the lower range because that was the actual percentage of results that exceeded 50 ppm in the original testing for the schools conducted by the Phylmar Group (Exhibit G to the First Daugherty Declaration). ENVIRON used 100% as an upper range. The major cost driver for Option A is the percentage of caulk containing greater than or equal to 50 ppm PCBs, which drives the extent of the overall PCB remediation efforts. The remediation efforts include the actual PCB abatement as well as the consultant sampling efforts associated with the pre-remedial characterization of PCB-containing caulk, remediation oversight, and post-remediation verification sampling to ensure the effectiveness of the remediation. Option A is considered to be a temporary solution since the encapsulated PCB-impacted substrate would remain in place, and would require future inspection, maintenance, and testing of the encapsulant's effectiveness at mitigating potential exposure to PCB-impacted materials and/or volatilization. This option is, in effect, the option currently approved by EPA for MHS and JCES where building materials have been identified and verified to be in excess of 50 ppm PCBs and the material will be removed but substrate next to the material will not be removed until later time during renovation or demolition (Exhibit C to the First Daugherty Declaration).

b. Option B is based on the complete removal and replacement of all PCB-impacted caulk, assuming that all that 40% to 100% of the caulk contains greater than or equal to 50 ppm PCBs, and the removal and replacement of adjacent PCB-contaminated substrate material containing greater than 1 ppm PCBs, as determined through pre-remedial testing, as required under TSCA. The major cost driver for Option B is the percentage of caulk containing greater than 50 ppm PCBs (see quantities in Option A above), which drives the extent of the overall PCB remediation efforts. The remediation efforts for this option include the actual PCB and substrate abatement, as well as the consultant sampling efforts associated with the pre-remedial characterization of PCB-containing caulk and impacted substrate, remediation oversight, and post-remediation verification sampling to ensure the effectiveness of the remediation. Option B is considered to be a permanent solution since all PCB-impacted caulk and adjacent PCB-contaminated substrate containing PCBs concentrations above EPA TSCA standards would be removed, making on-going inspection, maintenance, and testing unnecessary following successful verification sampling.

c. Because PCBs can be contained in many other building materials in addition to caulk, and 100% of all locations and concentrations of PCBs in building materials cannot be reasonably determined even with testing, Option C was developed to assure a 100% PCB removal and is, therefore, based on the demolition of MHS and JCES buildings constructed prior to 1981 and construction of new replacement school buildings with non-PCB containing building materials. Option C would entail the complete abatement of all identified PCB-impacted materials within the buildings (e.g., caulk, substrate, paint, mastics, sealants, lacquers, varnishes, laminating adhesives, tapes, flame retardants, and waterproofing coatings) and their proper disposal. Option C is considered to be a PCB-free solution since all identified PCB-containing and impacted materials will be removed and disposed.

50. For each option, unit costs were identified for various aspects of the characterization and remediation from project-specific data and literature review of PCB characterization and remediation projects at other schools in the United States. The range in the estimated costs developed by ENVIRON for the various options are a reflection of the range in unit costs used and a reasonable range in the assumptions made based on our professional experience and actual data from other schools and the District.

a. ENVIRON did an inspection and observed an estimated 34,700 linear feet (lf) of caulk in MHS/JCES. We used a 20% contingency factor to account for caulk that was not readily observable during our inspection (i.e., would have required destruction of building elements to observe it), and estimated there to be 41,650 lf of caulk in MHS/JCES.

b. ENVIRON also reviewed the literature for the cost per linear foot to remediate PCB-containing caulk. Based on this review, ENVIRON used a range of $50/lf - $172/lf in our cost estimate. Similarly, ENVIRON identified an additional cost of $10/lf - $20/lf to reinstall replacement caulk. The DeNicola Declaration used significantly lower removal cost of $15/lf - $30/lf and the low end of the estimate to replace the caulk.

c. While ENVIRON's estimate has been based on a build-up of the necessary technical, regulatory, and public participation activities, using a range of actual and recent unit costs experienced at other school sites and actual data from MHS/JCES, it appears that the DeNicola Declaration's estimate is unrealistically low because it has been based on an unsupported range of unit costs that an abatement contractor might estimate solely for its role in removing caulk. The DeNicola Declaration's estimate does not appear to consider the other technical, regulatory, or public participation activities required for such a project. Nor does the DeNicola Declaration's estimate appear to be based on measurements or data from a review of similar sites or professional experience.

51. The cost estimates for Option A range from $2.9M to $12.6M; Option B ranges from $4.4M to $25.4M; and Option C ranges from $171M to $295M. These costs represent potential consultant and contractor costs to the District only; they do not include costs for relocation of students, portable units to be used during relocation, or the District's administration costs for overseeing the project.

52. These estimates are similar to public information available for several other schools in the United States. However, it should be noted that all other schools, cited below, had air concentrations above EPA's Public Health Levels for Schools, while air concentrations at MHS and JCES have been either below the laboratory reporting limit or below EPA Public Health Levels for Schools.[2]

a. A feasibility study evaluated caulk remedial/mitigation options for five Public Schools in New York City where the cost estimates for abatement/mitigation of PCB-impacted building materials ranged from \$3.2M to \$3.6M per school. A true and correct copy of relevant excerpts of the document summarizing the feasibility study in the DOE PCB Chemical Action Plan is attached hereto as Exhibit 12.

b. For an elementary school in Lexington, MA, estimates to relocate the students during PCB remediation activities ranged from \$2.8 to \$4.2 million. Instead, officials decided to replace the school at a cost of \$40M. True and correct copies of the documents summarizing the relocation costs and replacement costs are attached hereto as Exhibits 17, 18, and 19.

c. For a Westport, MA school, the costs for the initial 2011 PCB remediation, designed to expedite the re-occupation of the school building, were approximately \$3.2M. A true and correct copy of relevant excerpts of this document is attached hereto as Exhibit 20. That project was a temporary solution because additional PCB source material remained in the building following completion. A feasibility study subsequently completed for that project recommended all the following additional actions to achieve a sustainable solution: 1) mandatory removal of remaining PCB source material at a cost of \$1.6M; 2) limited removal and encapsulation of known PCB Remediation Waste at a cost of \$4.4M; and 3) remediation of unconfirmed PCB Remediation Waste at a cost ranging from \$1.75M (for encapsulation) to \$2.1M (for removal). A true and correct copy of relevant excerpts of the feasibility study is attached hereto as Exhibit 21.

53. Undertaking significant caulk removal/remediation at this time, in addition to being incredibly costly, is not necessary. As discussed above, air and wipe sampling at the school buildings fall below EPA's PCB health protective benchmarks for schools and EPA's approvals require that all currently identified and verified exceedances of the TSCA threshold be removed by March 2016. In addition, any potential exceedances of the TSCA threshold in the school buildings will be removed at the time of renovation or demolition, as required by TSCA. EPA has stated that the schools are safe to be occupied now, and has approved the use of best management practices to ensure the school buildings are safe until renovation or demolition occurs. During the December 2013 Study Session, Steve Armann explained: "I think that what you've got good here is all of the air data to date is within our standards…the caulk, you know, let's address it in a timely manner, but in a smart manner. And if you're going through renovation of the buildings, or demolition, for that matter, deal with it in that structure rather than spending money, in a way, unnecessarily, at this time." *See* December 12, 2013 Board of Education Session, at 3:05:30-3:06:09. Existing caulk at the school should be appropriately managed in place pursuant to EPA's guidance.

I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct.

Executed this 10th day of April, 2015, at San Francisco, California.

____
Douglas Daugherty

EXHIBIT 1

TO: BOARD OF EDUCATION <u>STUDY SESSION</u>
12/12/13

FROM: SANDRA LYON

RE: UPDATE ON THE ENVIRONMENTAL CONCERNS AT MALIBU HIGH SCHOOL AND JUAN CABRILLO ELEMENTARY SCHOOL

STUDY SESSION ITEM NO. S.01

This study session is designed to allow the Board of Education to be fully updated about the environmental concerns at Malibu High School and Juan Cabrillo Elementary School. The board will be given an overview of the preliminary work done to date, including preliminary test results, as well as hear recommendations for a plan of action, including hiring an environmental engineering firm and the implementation of best management practices.

Representatives from the Environmental Protection Agency (EPA), Region 9; the Department of Toxic Substance Control (DTSC); and the Los Angeles County Department of Public Health will participate in the study session to answer board members' questions and explain their respective roles in the district's next steps.

***** ***** ***** ***** ***** *****

<u>Public Comments:</u>

- *Harold Greene, Cindy Vandor, Doug Wochna, Michael Omary, R.L. Embree, and Coleen Baum addressed the board regarding this matter.*

Ms. Lyon's presentation and the other handouts can be found under Attachments at the end of these minutes.

On behalf of the Board of Education, Ms. Lieberman expressed the board's desire to address this situation timely and methodically. She reported that the Malibu Schools Environmental Task Force and staff have been meeting almost weekly to determine what testing needs to be done and how to move forward expeditiously. They have also been working collectively to make sure the community's concerns are heard. Ms. Lieberman recognized representatives from Congressman Waxman's and Bloom's offices, who were present to observe. She introduced Mr. Armann and Dr. Wilson from the EPA, and Mr. Cota from the DTSC (Mr. Bellomo and Dr. Rangan from the Department of Public Health were unable to attend the study session). She thanked Ms. Lyon for her diligent work on this matter. Ms. Lyon introduced the members of the Malibu Schools Environmental Task Force during her presentation.

<u>Agencies' Summaries and Reponses to Board Members' Questions:</u>
Mr. Armann and Dr. Wilson explained that the EPA used residential setting guideline levels when analyzing the district's testing data. They stressed that while the testing data was preliminary and further testing will occur, the EPA was able to draw some conclusions, specifically that the air samples were well within the EPA's acceptable health risk-based range for schools and that it was safe for staff and students to return to the classrooms. Some of the caulk samples, however, exceeded the EPA's regulatory (not health risk-based) limit and therefore will need to be removed. They explained the difference between health risk-based vs. regulatory levels used when testing for PCBs. The health risk-based level addresses the risk of a person developing illness due to exposure to PCBs over a specific period of time. Conversely, the regulatory level is not related to health risks; however, a testing sample over this regulatory level will trigger EPA involvement and clean up because the EPA has been working to reduce the number of PCBs nationwide over decades, even where the levels found in a testing sample do not pose a health risk. Mr. Armann will work with the district to draft a clean-up plan to address areas where the levels are over the regulatory number. The district will implement the plan with EPA oversight.

Mr. Armann and Dr. Wilson explained the characteristics of PCBs, stating that they were commonly used in materials like caulking and light ballasts prior to 1977. Dr. Wilson first explained that the primary source of PCBs is often caulk, while the secondary source is usually air (PCBs can be released into the air from old, disintegrating caulk). He said that the health concern is not with the primary sources, but rather in secondary sources because humans breathe air, but do not *necessarily ingest window caulk. In regards to further testing, Mr. Armann said that once the district contracts with an environmental engineer, the EPA will work with that firm to develop a clean-up plan. Following the cleanup, the EPA will conduct verification testing to determine the level of PCBs. Ms. Lyon added that the Malibu Schools Environmental Task Force will assist in the process for hiring an environmental engineer.*

Mr. Cota explained the roles of the EPA and DTSC moving forward. In regards to the Arcadis report on soil remediation at Malibu High School a couple years ago, Mr. Cota commented that the testing and remediation were conducted appropriately and went beyond the guidelines normally recommended by DTSC. Ms. Lieberman asked Mr. Armann for his opinion regarding the district's next-steps plan and timeline. Mr. Armann replied that he thought it was appropriate. Mr. Patel asked the experts if they would send their own children to Malibu High School or Cabrillo Elementary School given the testing results. Mr. Armann and Mr. Cota said they would. Ms. Lieberman asked if future testing would include Juan Cabrillo Elementary School. Ms. Lyon said it would.

<u>Agencies' Responses to Task Force Members' Questions:</u>
Ms. Jennifer deNicola represented the Task Force, reading questions aloud from the Task Force as well as from index cards from members of the public. Mr. Armann explained the difference between measuring PCBs in the air versus the soil. Dr. Wilson explained congeners and aroclors. Mr. Cota explained that while the primary source of the PCBs might not be discovered (caulk is not the only source for PCBs), the testing data will reveal whether or not the classrooms are safe to occupy. A member of the public asked if the Cornucopia Project gardening project was safe to continue. Mr. Armann and Mr. Cota said there is no data for that area. Mr. Cota and his colleagues agreed that the preliminary data for pesticides in the area tested revealed levels within the acceptable range. He added that he could examine a list of pesticides that the district uses. Some parents wrote that they were unhappy with the independent study option that was offered to students during this time. Ms. Lyon said the district office will work with MHS staff regarding this matter. Mr. Cota said the DTSC will conduct a thorough soils study. Mr. Armann will work with the district regarding the air quality in the classrooms, specifically CO_2 levels. A member of the public asked how the wide range of health issues can be explained if the level of PCBs is safe. Dr. Wilson explained that there are many factors involved in the development of tumors in humans. He added that even the maximum concentration of PCB levels found in the testing do not indicate a causation for cancer. He said that the numbers used for exposure potential takes the body weight of children and adults into consideration. Mr. Armann assured everyone that it was safe for the classrooms to be occupied. He recommended best management practices for cleaning the rooms where the PCB levels exceeded the regulatory number. He said that once the district submits its cleaning plan, the EPA will reply within a week. It is recommended to conduct cleaning during an off-season. Following the cleaning, PCB levels will be tested again. The normal lab process turn-around is two weeks, after which the data will need to be analyzed. The cleaning process will follow best management practices, as outlined by the EPA, in order to prevent PCBs being released into the air. The question was asked about the health risk factor for teachers who have been at the campus for thirty years. Dr. Wilson replied that, based on the preliminary testing data, the risk of developing cancer is not likely. He added that the levels revealed in the testing are within the residential guidelines that place the risk for developing cancer – above and beyond the normal risk of a human developing cancer, which is one in three – by one in a million. A member of the public asked why the district would address the caulk in the library when the building is scheduled to be demolished as part of the Measure BB project. Mr. Armann replied that the air quality in the library is within limits, so he recommended following through with the best management practices for cleaning and then address the larger question of a demolition when the time comes. In regards to a communications plan, Ms. Lyon said the district will be hiring a program project coordinator who will be responsible for immediate, weekly communications as well as long-term communications. Ms. deNicola remarked that some parents still very concerned that the testing is not complete.

<u>Conclusion and Board Direction:</u>
Ms. Lyon said that an RFQ for an environmental engineer went out, and responses are due December 20. Interviews will be conducted in January, with the participation of the Task Force. Once credentials are verified, the contract can be ratified by the board in January. Ms. Lyon said that if the board gives direction, the district can move forward during winter break. Mr. Mechur

suggested reviewing the modernization plan for Building E to determine if it should be updated. Mr. Allen wondered how disruptive this whole process has been on the educational experience at Malibu High School. Ms. Lyon replied that at the beginning of October, some staff and parents said they did not feel safe being or having their children be in the building. Those classrooms were relocated out of an abundance of caution, and some students went on independent study. The board thanked the superintendent, task force members, and the agency representatives. Mr. Patel suggested sharing the information from tonight's study session with MHS and Cabrillo staff and parents. Ms. Lyon said that will be done, and she also reminded the board that the project coordinator will be writing weekly updates. Ms. Lieberman suggested that a letter be sent to staff and parents and posted online with a link to this information before winter break. She asked about the request of the music teachers to move back into their classrooms. Ms. Lyon said she will work with MHS and the agencies to take steps so they can move back into the classroom as soon as possible. The board gave direction to move forward with the timeline as shown in presentation.

EXHIBIT 2

PCBs in Caulk—Q&A

Background on PCB Exposure and Risk

1. What are PCBs?

Polychlorinated biphenyls, PCBs, are persistent manmade chemicals that were widely used in construction material and electrical products before 1979. In 1976, Congress banned the manufacture and use of PCBs because of concern about their health and environmental effects and they were phased out except for certain limited uses in 1979. The use and disposal of PCBs before the phase-out resulted in their widespread presence in our soil, air, water and food. Despite the federal ban, they remain present today in caulking and sealants used in the construction or renovation of older buildings before 1979.

2. What are the potential health effects of PCBs?

PCBs build up in our bodies over time, and PCB exposure over a long period of time can be harmful to our health.

Short term exposure to large amounts of PCBs can lead to skin conditions such as acne and rashes, decreased liver function, neurological effects, and gastrointestinal effects. These types of acute toxic effects due to high levels of exposure are generally rare. Chronic exposure to lower levels of PCBs may also cause health effects. In animal studies, PCBs have been shown to cause effects on the immune, reproductive, nervous and endocrine systems. PCBs have also been shown to cause cancer in animals. Some studies in humans provide supportive evidence for these health effects. Studies also show that PCBs in pregnant women can have an impact on their children's birth weight, short-term memory, and learning.

3. How are people exposed to PCBs?

Though PCBs were banned from production in 1979 they still typically exist in low-levels in our environment – in the food we eat, the air we breathe and in dirt and dust – and they build up in our bodies over many years. This long-term build-up of PCBs is what potentially causes harm. The levels of PCBs in our environment and in the bodies of people in this country have decreased significantly over time.

Food is a major source of exposure to PCBs. Fish (especially fish caught in polluted waters) contains small amounts of PCBs, as do meat and dairy products. People can also be exposed to PCBs by handling products that contain them, or by breathing in contaminated air or dust in areas where a product containing PCBs was disturbed or disposed. Workers whose jobs involve repairing or dismantling PCB-containing products are at the highest risk for exposure in this way. Indoor air and dust may also be a significant source of PCB exposure from PCB-contaminated caulk, electrical products, other building materials or products that contain PCBs.

18. What do we know about PCB concentrations in the soils surrounding schools constructed or renovated using PCB-contaminated building materials?

The soils surrounding schools can be contaminated with PCBs originating from building materials. Soils contaminated with PCBs from building materials are not well understood. Generally, we would expect that higher concentrations of PCB contaminated soils would be closer to school buildings.

Research Studies

19. What research has EPA conducted?

EPA research on PCBs in schools was designed to identify and evaluate potential sources of PCBs in order to better understand exposures to children, teachers, and other school workers, and to improve risk management decisions. EPA has investigated PCB-contaminated caulk, as well as other potential sources of PCBs in schools. Specifically, EPA's Office of Research and Development has:

- characterized potential sources of PCB exposures in schools (caulk, coatings, adhesives light ballasts, etc.)
- investigated the relationship of these sources to PCB concentrations in air, dust, and soil
- evaluated methods to reduce exposures to PCBs in caulk and other sources.

Measures to reduce PCB exposure in Schools or Other Buildings

20. Are my children in danger if my school or building has PCB-containing caulk?

PCBs may cause serious harm when exposure occurs over a long period of time. That is why EPA has recommended a goal of minimizing students' and teachers' exposure to PCBs. It should be recognized that exceeding EPA's levels for a school exposure does not mean that adverse effects will necessarily occur. Because PCBs accumulate over such long averaging times, short term exceedances of the levels will likely cause only small changes to human blood concentrations, and these can be offset by other periods of exposure to lower air levels. Comparing total exposure from all sources to the levels is a conservative, health protective estimate, as it assumes that most of the inhaled PCB is absorbed and none exhaled.

21. What are the best near-term actions to reduce PCB exposures in buildings with PCB-containing caulk?

It is important to minimize exposure to PCBs from caulk and its residues through inhalation, skin contact or ingestion. Where schools or other buildings were built or renovated between 1950 and 1979 an important step that can be done is to minimize the potential for PCBs to be present

EXHIBIT 3

TABLE AC-1
PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS

Chemical Abstracts Registry Number [a]	Skin[b]	Name[c]	PEL [d] ppm[e]	PEL [d] mg/M3[f]	PEL [d] Ceiling[g]	STEL [o] ppm[e]	STEL [o] mg/M3[f]
108032		1-Nitropropane	25	90			
79469		2-Nitropropane	10	35			
62759		N-Nitrosodimethylamine, see Section 5209					
1321126, 99081, 88722, 99990	S	Nitrotoluene	2	11			
76062		Nitrotrichloromethane; see Chloropicrin					
10024972		Nitrous oxide	50	90			
111842		Nonane	200	1,050			
		Nuisance particulates, see Particulates not otherwise regulated					
		Total dust	--	10			
		Respirable fraction[n]	--	5			
2234131	S	Octachloronaphthalene	--	0.1		--	0.3
111659		Octane	300	1,450		375	1800
8012951		Oil (mineral) mist, particulate	--	(5)[l]			
		Oil (vegetable) mists (except castor, cashew nut or similar irritant oils); see Nuisance particulates					
		Organic arsenic compounds; see Arsenic, organic					
20816120		Osmium tetroxide, as Os	0.0002	0.002		0.0006	0.006
144627		Oxalic acid	--	1		--	2
7783417		Oxygen difluoride	0.05	0.1	C		
10028156		Ozone	0.1	0.2		0.3	0.6
8002742		Paraffin wax fume	--	2			
1910425, 2074502	S	Paraquat, total particulates	--	0.5			
1910425, 2074502	S	Paraquat, respirable sizes	--	0.1[n]			
56382	S	Parathion; o,o-diethyl o-(p-nitrophenyl) phosphorothioate	--	0.1			
		Particulates not otherwise regulated					
		Total dust	--	10			
		Respirable fraction[n]	--	5			
		Particulate polycyclic; aromatic hydrocarbons (PPAH) see Coal tar pitch volatiles					
		PCB; see Chlorodiphenyl					
87865	S	PCP; see Pentachlorophenol					
19624227		Pentaborane	0.005	0.01		0.015	0.03
1321648	S	Pentachloronaphthalene	--	0.5			
87865	S	Pentachlorophenol; PCP	--	0.5			
115775		Pentaerythritol; tetrakis-(hydroxymethyl)methane; tetra-methylolmethane; see Particulates not otherwise regulated					
109660		Pentane	600	1,800			
107879		2-Pentanone; see Methyl propyl ketone					

TABLE AC-1

PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS

Chemical Abstracts Registry Number [a]	Skin[b]	Name[c]	PEL [d] ppm[e]	PEL [d] mg/M3[f]	PEL [d] Ceiling[g]	STEL [o] ppm[e]	STEL [o] mg/M3[f]
628637; 626380; 123922; 625161; 620111; 624419		Pentyl acetate	50	266		100	532
67721		Perchloroethane; see Hexachloroethane					
127184		Perchloroethylene	25	170	300 ppm	100	685
594423		Perchloromethyl mercaptan; trichloromethanethiol	0.1	0.8			
7616946		Perchloryl fluoride; $C1O_3F$	3	14		6	28
382218		Perfluoroisobutylene	0.01	0.082	C		
		Perlite					
		Total dust	--	10			
		Respirable fraction[n]	--	5			
108952	S	Phenol	5	19			
92842	S	Phenothiazine; dibenzothiazine	--	5			
106503	S	p-Phenylenediamine	--	0.1			
101848		Phenyl ether, vapor	1	7			
100425		Phenylethylene; see Styrene					
122601	S	Phenyl glycidyl ether, PGE;1,2-epoxy-3-phenoxypropane	0.1	0.6			
100630	S	Phenylhydrazine	5	20		10	45
108985		Phenyl mercaptan	0.5	2			
638211		Phenylphosphine	0.05	0.25	C		
298022	S	Phorate; o,o-diethyl S-(ethylthio)methyl phosphorodithioate	--	0.05		--	0.2
75445		Phosgene; carbonyl chloride; $COCl_2$	0.1	0.4			
7803512		Phosphine; PH_3	0.3	0.4		1	1
7664382		Phosphoric acid	--	1		--	3
7723140		Phosphorus, yellow	--	0.1			
10025873		Phosphorus oxychloride	0.1	0.6			
10026138		Phosphorus pentachloride	0.1	1			
1314803		Phosphorus pentasulfide; P_2S_5	--	1		--	3
7719122		Phosphorus trichloride	0.2	1.5		0.5	3
85449		Phthalic anhydride	1	6			
626175		m-Phthalodinitrile	--	5			
1918021		Picloram	--				
		Total dust	--	10			
		Respirable fraction[n]	--	5			
88891	S	Picric acid; 2,4,6-trinitrophenol	--	0.1			
83261		Pindone; 2-pivalyl-1, 3-indandione		0.1			
142643		Piperazine dihydrochloride	--	5			
26499650		Plaster of Paris; calcium sulfate hemihydrate; see Particulates not otherwise regulated					
7440064		Platinum, metal	--	1			
		Platinum, soluble salts, as Pt	--	0.002			
		Polychlorobiphenyls, see Chlorodiphenyl					
		Polytetrafluoroethylene, decomposition products	--	(m)			

TABLE AC-1
PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS

Chemical Abstracts Registry Number [(a)]	*Skin*[(b)]	*Name*[(c)]	*PEL* [(d)] *ppm*[(e)]	*PEL* *mg/M*[3(f)]	*Ceiling*[(g)]	*STEL* [(o)] *ppm*[(e)]	*STEL* *mg/M*[3(f)]
		Zinc oxide dust, see Particulates not otherwise regulated					
11103869		Zinc potassium chromate, as Cr (see also Sections 1532.2, 5206 & 8359)	--	0.005			
557051		Zinc stearate	--	10			
37300235		Zinc yellow, as Cr (see also Sections 1532.2, 5206 & 8359)	--	0.005			
		Zirconium compounds, as Zr	--	5		--	10

S

Footnotes to Table AC-1

(a) The Chemical Abstracts Service Registry Number is a designation used to identify a specific compound or substance regardless of the naming system; these numbers were obtained from the Desk Top Analysis Tool for the Common Data Base and from the Chemical Abstracts Indexes.

(b) Refer to section 5155(d) for the significance of the Skin notation.

(c) Trade Names Removed from Table AC-1.

Trade Name		Chemical/Generic Name
Abate	see	Temephos
Ammate	see	Ammonium Sulfamate
Aqualin	see	Acrolein
Arasan	see	Thiram
Azodrin	see	Moncrotophos
Baygon	see	Propoxur
Bidrin	see	Dicrotophos
Butyl Cellosolve	see	2-Butoxyethanol
Cellosolve	see	2-Ethoxyethanol
Cellosolve Acetate	see	2-Ethoxyethyl acetate
Compound 1080	see	Sodium Fluoracetate
Coyden	see	Clopidol
Crag Herbicide	see	Sesone
Cythion	see	Malathion
Dasanit	see	Fensulfothion
Delnav	see	Dioxathion
Dibrom	see	Naled
Difolatan	see	Captafol
Disyston	see	Disulfoton
Dowtherm A	see	Phenylether and Biphenyl
Dursban	see	Chloropyrifos
Dyfonate	see	Fonofos
Fermate	see	Ferbam
Freons	see	Fluorocarbons
Furadan	see	Carbofuran
Guthion	see	Azinphos Methyl
Korlan	see	Ronnel
Lannate	see	Methomyl
Mariate	see	Methoxychlor
MLT	see	Malathion

TABLE AC-1
PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS

Moxie	see	Methoxychlor
Nialate	see	Ethion
Nankor	see	Ronnel
Phosdrin	see	Mevinphos
Pival	see	Pindone
Plictran	see	Cyhexatin
Santobrite	see	Pentachlorophenol
Sevin	see	Carbaryl
Systox	see	Demeton
Teflon	see	Polytetrafluoroethylene
Thimet	see	Phorate
Thiodan	see	Endosulfan
Tordon	see	Picloram
Trolene	see	Ronnel
Vapona	see	Dichlorvos
Weedone 638	see	2, 4-D
Zoalene	see	Dinitolmide

(d) For the definition and the application of the Permissible Exposure Limit (PEL), refer to section 5155(b) and (c)(1).

(e) Parts of gas or vapor per million parts of air by volume at 25°C and 760mm Hg pressure.

(f) Milligrams of substance per cubic meter of air at 25°C and 760mm Hg pressure.

(g) Refer to section 5155(b) and (c)(3) for the significance of the Ceiling notation. A "C" notation in this column means the values given in the PEL columns are ceiling values. A numerical entry in this column represents a ceiling value in addition to the TWA values.

(h) A number of gases and vapors, when present in high concentrations, act primarily as asphyxiants without other adverse effects. A concentration limit is not included for each material because the limiting factor is the available oxygen. (Several of these materials present fire or explosion hazards.)

(i) Coal tar pitch volatiles (benzene or cyclohexane-soluble fraction) include fused polycyclic hydrocarbons (some of which are known carcinogens) which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the "coal tar pitch volatiles" standard.

(j) This standard applies to the cotton waste processing operations of waste recycling (sorting, blending, cleaning, and willowing) and garnetting. It does not apply to cotton gins, cottonseed oil industry, or operations covered by section 5190.

(k) A PEL of 0.05 ppm shall apply to exposures involving a mixture of ethylene glycol dinitrate and nitroglycerin.

(l) As sampled by method that does not collect vapor.

(m) Thermal decomposition of the fluorocarbon chain in air leads to the formation of oxidized products containing carbon, fluorine and oxygen. An index of exposure to these products is possible through their alkaline hydrolysis followed by a quantitative determination of fluoride content. No particular concentration limit is specified pending evaluation of the toxicity of the products but concentrations should be kept below the sensitivity of the analytical method.

(n) The concentration and percentage of the particulate used for this limit are determined from the fraction passing a size selector with the following characteristics:

Aerodynamic Diameter in Micrometers (unit density sphere)		*Percent Passing Selector*
0	....	100
1	....	97
2	....	91
3	....	74
4	....	50
5	....	30
6	....	17
7	....	9
8	....	5
10	....	1

(o) Refer to sections 5155(b) and (c)(2) for the definition and application of the Short Term Exposure Limit (STEL).

(p) (Reserved)

(q) Fibers per cubic centimeter of air at 25°C and 760mm Hg pressure. To be considered a fiber for this limit the glass particle must be longer than 5µm, have a length to diameter ratio of three or more, and have a diameter less than 3µm. The National Institute for Occupational Safety and Health (NIOSH), Method 7400, Issue 2, August 15, 1994, which is hereby incorporated by reference, shall be used for measuring airborne fiber concentrations.

(r) Compliance with the subtilisins PEL is assessed by sampling with a high volume sampler (600-800 liters per minute) for at least 60 minutes.

(s) The concentration and percentage of the particulate used for this limit are determined from the fraction passing a size selector with the following characteristics:

Aerodynamic Diameter in Micrometers (unit density sphere)		*Percent Passing Selector*
0	....	100
1	....	97
2	....	94
5	....	87
10	....	77
20	....	65

30	....	58
40	....	54.5
50	....	52.2
100	....	50

(t) Glutaraldehyde can cause occupational asthma and skin sensitization responses such as contact dermatitis. Exposure related symptoms may include one or more of the following: shortness of breath, chest tightness, wheeze, cough, skin rash, hives, and irritation of the nose, throat, skin or eye. Hazard communication training required by sections 5191 or 5194 shall address these health hazards and symptoms along with the measures taken by the employer to evaluate and control exposures that can include medical evaluations, exposure monitoring, ventilation systems, work practices, and personal protective equipment. The communication system required by section 3203 shall inform employees where to report possible health symptoms and where to ask questions, report concerns, and receive information about the employer's evaluation and control measures.

(u) This PEL applies to the sum of the exposures to the substance in the vapor state and from the particulate fraction specified in footnote (s) in this table.

Note: Authority cited: Section 142.3, Labor Code. Reference: Sections 142.3 and 144.6, Labor Code.

EXHIBIT 4

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; J = New Jersey; O = EPA Office of Water; F = See FAQ; E = Environmental Criteria and Assessment Office; S = see user guide Section 5; L = see user guide on lead; M = mutagen; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; n = noncancer; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); SSL values are based on DAF=1

Information						Contaminant		Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1
IUR (ug/m^3)$^{-1}$	key	RfC$_i$ (mg/m^3)	key	voc	muta-gen	Analyte	CAS No.	Carcinogenic SL TR=1.0E-6 (ug/m^3)	Noncarcinogenic SL HI=1 (µg/m^3)
						Phenylphenol, 2-	90-43-7		
						Phorate	298-02-2		
		3.0E-04	I	V		Phosgene	75-44-5		3.1E-01
						Phosmet	732-11-6		
						Phosphates, Inorganic			
						~Aluminum metaphosphate	13776-88-0		
						~Ammonium polyphosphate	68333-79-9		
						~Calcium pyrophosphate	7790-76-3		
						~Diammonium phosphate	7783-28-0		
						~Dicalcium phosphate	7757-93-9		
						~Dimagnesium phosphate	7782-75-4		
						~Dipotassium phosphate	7758-11-4		
						~Disodium phosphate	7558-79-4		
						~Monoaluminum phosphate	13530-50-2		
						~Monoammonium phosphate	7722-76-1		
						~Monocalcium phosphate	7758-23-8		
						~Monomagnesium phosphate	7757-86-0		
						~Monopotassium phosphate	7778-77-0		
						~Monosodium phosphate	7558-80-7		
						~Polyphosphoric acid	8017-16-1		
						~Potassium tripolyphosphate	13845-36-8		
						~Sodium acid pyrophosphate	7758-16-9		
						~Sodium aluminum phosphate (acidic)	7785-88-8		
						~Sodium aluminum phosphate (anhydrous)	10279-59-1		
						~Sodium aluminum phosphate (tetrahydrate)	10305-76-7		
						~Sodium hexametaphosphate	10124-56-8		
						~Sodium polyphosphate	68915-31-1		
						~Sodium trimetaphosphate	7785-84-4		
						~Sodium tripolyphosphate	7758-29-4		
						~Tetrapotassium phosphate	7320-34-5		
						~Tetrasodium pyrophosphate	7722-88-5		
						~Trialuminum sodium tetra decahydrogenoctaorthophosphate (dihydrate)	15136-87-5		
						~Tricalcium phosphate	7758-87-4		
						~Trimagnesium phosphate	7757-87-1		
						~Tripotassium phosphate	7778-53-2		
						~Trisodium phosphate	7601-54-9		
		3.0E-04	I			Phosphine	7803-51-2		3.1E-01
		1.0E-02	I			Phosphoric Acid	7664-38-2		1.0E+01
						Phosphorus, White	7723-14-0		
						Phthalates			
2.4E-06	C					~Bis(2-ethylhexyl)phthalate	117-81-7	1.2E+00	
						~Butylphthalyl Butylglycolate	85-70-1		
						~Dibutyl Phthalate	84-74-2		
						~Diethyl Phthalate	84-66-2		
				V		~Dimethylterephthalate	120-61-6		
						~Octyl Phthalate, di-N-	117-84-0		
						~Phthalic Acid, P-	100-21-0		
		2.0E-02	C			~Phthalic Anhydride	85-44-9		2.1E+01
						Picloram	1918-02-1		
						Picramic Acid (2-Amino-4,6-dinitrophenol)	96-91-3		
						Pirimiphos, Methyl	29232-93-7		
8.6E-03	C					Polybrominated Biphenyls	59536-65-1	3.3E-04	
						Polychlorinated Biphenyls (PCBs)			
2.0E-05	S					~Aroclor 1016	12674-11-2	1.4E-01	
5.7E-04	S			V		~Aroclor 1221	11104-28-2	4.9E-03	
5.7E-04	S			V		~Aroclor 1232	11141-16-5	4.9E-03	
5.7E-04	S					~Aroclor 1242	53469-21-9	4.9E-03	
5.7E-04	S					~Aroclor 1248	12672-29-6	4.9E-03	
5.7E-04	S					~Aroclor 1254	11097-69-1	4.9E-03	
5.7E-04	S					~Aroclor 1260	11096-82-5	4.9E-03	
						~Aroclor 5460	11126-42-4		
1.1E-03	E	1.3E-03	E			~Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)	39635-31-9	2.5E-03	1.4E+00
1.1E-03	E	1.3E-03	E			~Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)	52663-72-6	2.5E-03	1.4E+00
1.1E-03	E	1.3E-03	E			~Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)	69782-90-7	2.5E-03	1.4E+00
1.1E-03	E	1.3E-03	E			~Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)	38380-08-4	2.5E-03	1.4E+00
1.1E+00	E	1.3E-06	E			~Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)	32774-16-6	2.5E-06	1.4E-03
1.1E-03	E	1.3E-03	E			~Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)	65510-44-3	2.5E-03	1.4E+00
1.1E-03	E	1.3E-03	E			~Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)	31508-00-6	2.5E-03	1.4E+00
1.1E-03	E	1.3E-03	E			~Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)	32598-14-4	2.5E-03	1.4E+00
1.1E-03	E	1.3E-03	E			~Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)	74472-37-0	2.5E-03	1.4E+00
3.8E+00	E	4.0E-07	E			~Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)	57465-28-8	7.4E-07	4.2E-04
5.7E-04	I					~Polychlorinated Biphenyls (high risk)	1336-36-3	4.9E-03	
1.0E-04	I					~Polychlorinated Biphenyls (low risk)	1336-36-3	2.8E-02	
2.0E-05	I					~Polychlorinated Biphenyls (lowest risk)	1336-36-3	1.4E-01	
3.8E-03	E	4.0E-04	E			~Tetrachlorobiphenyl, 3,3',4,4'- (PCB 77)	32598-13-3	7.4E-04	4.2E-01
1.1E-02	E	1.3E-04	E			~Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)	70362-50-4	2.5E-04	1.4E-01
		6.0E-04	I			Polymeric Methylene Diphenyl Diisocyanate (PMDI)	9016-87-9		6.3E-01
						Polynuclear Aromatic Hydrocarbons (PAHs)			

EXHIBIT 5

User's Guide (November 2014)

Table of Contents

For assistance/questions please use the rsl table contact us page

Disclaimer

This guidance sets forth a recommended, but not mandatory, approach based upon currently available information with respect to risk assessment for response actions at CERCLA sites. This document does not establish binding rules. Alternative approaches for risk assessment may be found to be more appropriate at specific sites (e.g., where site circumstances do not match the underlying assumptions, conditions and models of the guidance). The decision whether to use an alternative approach and a description of any such approach should be documented for such sites. Accordingly, when comments are received at individual CERCLA sites questioning the use of the approaches recommended in this guidance, the comments should be considered and an explanation provided for the selected approach.

It should also be noted that the screening levels (SLs) in these tables are based upon human health risk and do not address potential ecological risk. Some sites in sensitive ecological settings may also need to be evaluated for potential ecological risk. EPA's guidance "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessment" http://www.epa.gov/oswer/riskassessment/ecorisk/ecorisk.htm contains an eight step process for using benchmarks for ecological effects in the remedy selection process.

1. Introduction

The purpose of this website is to provide default screening tables and a calculator to assist Remedial Project Managers (RPMs), On Scene Coordinators (OSC's), risk assessors and others involved in decision-making concerning CERCLA hazardous waste sites and to determine whether levels of contamination found at the site may warrant further investigation or site cleanup, or whether no further investigation or action may be required.

Users within and outside the CERCLA program should use the tables or calculator results at their own discretion and they should take care to understand the assumptions incorporated in these results and to apply the SLs appropriately.

The SLs presented in the Generic Tables are chemical-specific concentrations for individual contaminants in air, drinking water and soil that may warrant further investigation or site cleanup. The SLs generated from the calculator may be site-specifc concentrations for individual chemicals in soil, air, water and fish. **It should be emphasized that SLs are not cleanup standards**. We also do not recommend that the RSLs be used as cleanup levels for Superfund Sites until the recommendations in EPA's Supplemental Guidance to Risk Assessment Guidance for Superfund, Volume I, Part A ("Community Involvement in Superfund Risk Assessments" http://www.epa.gov/oswer/riskassessment/ragsa/pdf/ci_ra.pdf) have been addressed. SLs should not be used as cleanup levels for a CERCLA site until the other remedy selections identified in the relevant portions of the National Contingency Plan (NCP), 40 CFR Part 300, have been evaluated and considered. PRGs (Preliminary Remediation Goals) is a term used to describe a project team's early and evolving identification of possible remedial goals. PRGs may be initially identified early in the Remedial Investigation/ Feasibility Study (RI/FS) process (e.g., at RI scoping) to select appropriate detection limits for RI sampling. Typically, it is necessary for PRGs to be more generic early in the process and to become more refined and site-specific as data collection and assessment progress. The SLs identified on this website are likely to serve as PRGs early in the process--e.g., at RI scoping and at screening of chemicals of potential concern (COPCs) for the baseline risk assessment. However, once the baseline risk assessment has been performed, PRGs can be derived from the calculator using site-specific risks, and the SLs in the Generic Tables are less likely to apply. PRGs developed in the FS will usually be based on site-specific risks and Applicable or Relevant and Appropriate Requirements (ARARs) and not on generic SLs.

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6. Using the Calculator

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7. References

For assistance/questions please use the rsl table contact us page

EXHIBIT 6

Polychlorinated biphenyls (PCBs) (CASRN 1336-36-3)

Note: A SUPPORT DOCUMENT is available for this chemical. Similar documents can be found in the List of Available IRIS Toxicological Reviews.

0294

Polychlorinated biphenyls (PCBs); CASRN 1336-36-3; (06/01/1997)

Human health assessment information on a chemical substance is included in the IRIS database only after a comprehensive review of toxicity data, as outlined in the IRIS assessment development process. Sections I (Health Hazard Assessments for Noncarcinogenic Effects) and II (Carcinogenicity Assessment for Lifetime Exposure) present the conclusions that were reached during the assessment development process. Supporting information and explanations of the methods used to derive the values given in IRIS are provided in the guidance documents located on the IRIS website.

STATUS OF DATA FOR PCBs

File First On-Line 05/01/1989

Category (section)	**Status**	**Last Revised**
Oral RfD Assessment (I.A.)	message	06/01/1994
Inhalation RfC Assessment (I.B.)	no data	
Carcinogenicity Assessment (II.)	on-line	06/01/1997

_I. Chronic Health Hazard Assessments for Noncarcinogenic Effects

_I.A. Reference Dose for Chronic Oral Exposure (RfD)

Substance Name — Polychlorinated biphenyls (PCBs)
CASRN — 1336-36-3

__I.A.1. Oral RfD Summary

Please check the following individual aroclor files for RfD assessments: Aroclor 1016, Aroclor 1248, and Aroclor 1254.

_I.B. Reference Concentration for Chronic Inhalation Exposure (RfC)

Substance Name — Polychlorinated biphenyls (PCBs)
CASRN — 1336-36-3

Not available at this time.

_II. Carcinogenicity Assessment for Lifetime Exposure

Substance Name — Polychlorinated biphenyls (PCBs)
CASRN — 1336-36-3
Last Revised — 06/01/1997

Section II provides information on three aspects of the carcinogenic assessment for the substance in question; the weight-of-evidence judgment of the likelihood that the substance is a human carcinogen, and quantitative estimates of risk from oral exposure and from inhalation exposure. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. The rationale and methods used to develop the carcinogenicity information in IRIS are described in The Risk Assessment Guidelines of 1986 (EPA/600/8-87/045) and in the IRIS Background Document. IRIS summaries developed since the publication of EPA's more recent Proposed Guidelines for Carcinogen Risk Assessment also utilize those Guidelines where indicated (Federal Register 61(79):17960-18011, April 23, 1996). Users are referred to Section I of this IRIS file for information on long-term toxic effects other than carcinogenicity.

_II.A. Evidence for Human Carcinogenicity

__II.A.1. Weight-of-Evidence Characterization

Classification — B2; probable human carcinogen

Basis — A 1996 study found liver tumors in female rats exposed to Aroclors 1260, 1254, 1242, and 1016, and in male rats exposed to 1260. These mixtures contain overlapping groups of congeners that, together, span the range of congeners most often found in environmental mixtures. Earlier studies found high, statistically significant incidences of liver tumors in rats ingesting Aroclor 1260 or Clophen A 60 (Kimbrough et al., 1975; Norback and Weltman, 1985; Schaeffer et al., 1984). Mechanistic studies are beginning to identify several congeners that have dioxin-like activity and may promote tumors by different modes of action. PCBs are absorbed through ingestion, inhalation, and dermal exposure, after which they are transported similarly through the circulation. This provides a reasonable basis for expecting similar internal effects from different routes of environmental exposure.

Information on relative absorption rates suggests that differences in toxicity across exposure routes are small. The human studies are being updated; currently available evidence is inadequate, but suggestive.

__II.A.2. Human Carcinogenicity Data

Inadequate. A cohort study by Bertazzi et al. (1987) analyzed cancer mortality among workers at a capacitor manufacturing plant in Italy. PCB mixtures with 54%, then 42% chlorine were used through 1980. The cohort included 2100 workers (544 males and 1556 females) employed at least 1 week. At the end of followup in 1982, there were 64 deaths reported, 26 from cancer. In males, a statistically significant increase in death from gastrointestinal tract cancer was reported, compared with national and local rates (6 observed, 1.7 expected using national rates, SMR=346, CI=141-721; 2.2 expected using local rates, SMR=274, CI=112-572). In females, a statistically significant excess risk of death from hematologic cancer was reported, compared with local, but not national, rates (4 observed, 1.1 expected, SMR=377, CI=115- 877). Analyses by exposure duration, latency, and year of first exposure revealed no trend; however, the numbers are small.

A cohort study by Brown (1987) analyzed cancer mortality among workers at two capacitor manufacturing plants in New York and Massachusetts. At both plants the Aroclor mixture being used changed twice, from 1254 to 1242 to 1016. The cohort included 2588 workers (1270 males and 1318 females) employed at least 3 months in areas of the plants considered to have potential for heavy exposure to PCBs. At the end of followup in 1982, there were 295 deaths reported, 62 from cancer. Compared with national rates, a statistically significant increase in death from cancer of the liver, gall bladder, and biliary tract was reported (5 observed, 1.9 expected, SMR=263, $p<0.05$). Four of these five occurred among females employed at the Massachusetts plant. Analyses by time since first employment or length of employment revealed no trend; however, the numbers are small.

A cohort study by Sinks et al. (1992) analyzed cancer mortality among workers at a capacitor manufacturing plant in Indiana. Aroclor 1242, then 1016, had been used. The cohort included 3588 workers (2742 white males and 846 white females) employed at least 1 day. At the end of followup in 1986, there were 192 deaths reported, 54 from cancer. Workers were classified into five exposure zones based on distance from the impregnation ovens. Compared with national rates, a statistically significant excess risk of death from skin cancer was reported (8 observed, 2.0 expected, SMR=410, CI=180-800); all were malignant melanomas. A proportional hazards analysis revealed no pattern of association with exposure zone; however, the numbers are small.

Other occupational studies by NIOSH (1977), Gustavsson et al. (1986) and Shalat et al. (1989) looked for an association between occupational PCB exposure and cancer mortality. Because of small sample sizes, brief followup periods, and confounding exposures to other potential carcinogens, these studies are inconclusive.

Accidental ingestion: Serious adverse health effects, including liver cancer and skin disorders, have been observed in humans who consumed rice oil contaminated with PCBs in the "Yusho" incident in Japan or the "Yu-Cheng" incident in Taiwan. These effects have been attributed, at least in part, to heating of the PCBs and rice oil, causing formation of chlorinated dibenzofurans, which have the same mode of action as some PCB congeners (ATSDR, 1993; Safe, 1994).

__II.A.3. Animal Carcinogenicity Data

Sufficient. Brunner et al. (1996) compared carcinogenicity across different Aroclors, dose levels, and sexes. Groups of 50 male or female Sprague-Dawley rats were fed diets with 25, 50, or 100 ppm Aroclor 1260 or 1254; 50 or 100 ppm Aroclor 1242; or 50, 100, or 200 ppm Aroclor 1016. There were 100 controls of each sex. The animals were killed at 104 weeks, after which a complete histopathologic evaluation was performed for control and high-dose groups; histopathologic evaluations of liver, brain, mammary gland, and male thyroid gland were also performed for low- and mid-dose groups.

Statistically significant increased incidences of liver adenomas or carcinomas were found in female rats for all Aroclors and in male rats for Aroclor 1260. Some of these tumors were hepatocholangiomas, a rare bile duct tumor seldom seen in control rats.

To investigate tumor progression after exposure has stopped, groups of 24 female rats were exposed for 52 weeks, then exposure was discontinued for an additional 52 weeks before the rats were killed. For Aroclors 1254 and 1242, tumor incidences from the stop study were approximately half those of the lifetime study; that is, nearly proportional to exposure duration. In contrast, stop-study tumor incidences were zero for Aroclor 1016, while for Aroclor 1260 they were generally greater than half those of the lifetime study. For 100 ppm Aroclor 1260, the stop study incidence was greater than that of the lifetime study, 71 vs. 48 percent.

Thyroid gland follicular cell adenomas or carcinomas were increased in males for all Aroclors; significant dose trends were noted for Aroclors 1254 and 1242. The increases did not continue proportionately above the lowest dose. No trends were apparent in females.

In female rats, the incidence of mammary tumors was decreased with lifetime exposure to Aroclor 1254 and, to a lesser extent, to 1260 or 1242; this result was not observed for Aroclor 1016. Decreases did not occur for any Aroclor in the stop study. The first mammary tumor was observed at a later age in the dosed groups.

Kimbrough et al. (1975) fed groups of 200 female Sherman rats diets with 0 or 100 ppm Aroclor 1260 for about 21 months. Six weeks later the rats were killed and their tissues were examined. Hepatocellular carcinomas and neoplastic nodules were significantly increased in rats fed Aroclor 1260.

The National Cancer Institute (NCI, 1978) fed groups of 24 male or female Fischer 344 rats diets with 0, 25, 50, or 100 ppm Aroclor 1254 for 104-105 weeks (24 months). Then the rats were killed and their tissues were examined. The combined incidence of leukemia and lymphoma in males was significantly increased by the Cochran-Armitage trend test; however, since Fisher exact tests were not also significant, NCI did not consider this result clearly related to Aroclor 1254. Hepatocellular adenomas and carcinomas were increased. Morgan et al. (1981) and Ward (1985) reevaluated gastric lesions from this study and found 6 adenocarcinomas in 144 exposed rats. This result is statistically significant, as gastric adenocarcinomas had occurred in only 1 of 3548 control male and female Fischer 344 rats in the NCI testing program. Intestinal metaplasia in exposed rats differed morphologically from controls, suggesting Aroclor 1254 can act as a tumor initiator.

Schaeffer et al. (1984) fed male weanling Wistar rats a standard diet for 8 weeks, then divided them into three groups. One group was fed the basic diet; for the other groups 100 ppm Clophen A 30 or A 60 was added. Rats were killed at 801 832 days (26.3 27.3 months)

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and were examined for lesions in the liver and some other tissues. For both mixtures, preneoplastic liver lesions were observed after 500 days (16.4 months) and hepatocellular carcinomas after 700 days (23 months) in rats dying before the end of the study. The investigators concluded, "Clophen A 60 had a definite, and Clophen A 30 a weak, carcinogenic effect on rat liver."

Norback and Weltman (1985) fed groups of male and female Sprague-Dawley rats diets of 0 or 100 ppm Aroclor 1260 for 16 months; the latter dose was reduced to 50 ppm for 8 more months. After 5 additional months on the control diet, the rats were killed and their livers were examined. Partial hepatectomy was performed on some rats at 1, 3, 6, 9, 12, 15, 18, and 24 months to evaluate sequential morphologic changes. In males and females fed Aroclor 1260, liver foci appeared at 3 months, area lesions at 6 months, neoplastic nodules at 12 months, trabecular carcinomas at 15 months, and adenocarcinomas at 24 months, demonstrating progression of liver lesions to carcinomas. By 29 months, 91% of females had liver carcinomas and 95% had carcinomas or neoplastic nodules; incidences in males were smaller, 4% and 15%, respectively. Vater et al. (1995) obtained individual animal results to determine whether the partial hepatectomies, which exert a strong proliferative effect on the remaining tissue, affected the incidence of liver tumors. They reported that the hepatectomies did not increase the tumor incidence. Among females fed Aroclor 1260, liver tumors developed in 4 of 7 animals with hepatectomies and 37 of 39 without hepatectomies; no liver tumors developed in controls or males with hepatectomies.

Moore et al. (1994) reevaluated the preceding rat liver findings (Kimbrough et al., 1975; NCI, 1978; Schaeffer et al., 1984; Norback and Weltman, 1985) using criteria and nomenclature that had changed to reflect new understanding of mechanisms of toxicity and carcinogenesis. The reevaluation found somewhat fewer tumors than did the original investigators. The apparent increase for Clophen A 30 (Schaeffer et al., 1984) is no longer statistically significant.

__II.A.4. Supporting Data for Carcinogenicity

Several studies of less-than-lifetime exposure are supportive of a carcinogenic response (Kimbrough et al., 1972; Kimbrough and Linder, 1974; Kimura and Baba, 1973; Ito et al., 1973, 1974; Rao and Banerji, 1988).

PCBs give generally negative results in tests of genetic activity (ATSDR, 1993), implying that PCBs induce tumors primarily through modes of action that do not involve gene mutation. Initiation-promotion studies for several commercial PCB mixtures and congeners show tumor promoting activity in liver and lung; these studies are beginning to identify a subset of mixture components that may be significant contributors to cancer induction (Silberhorn et al., 1990). Toxicity of some PCB congeners is correlated with induction of mixed-function oxidases; some congeners are phenobarbital-type inducers, others are 3-methylcholanthrene-type inducers, and some have mixed inducing properties (McFarland and Clarke, 1989). The latter two groups most resemble 2,3,7,8-tetrachlorodibenzo-p-dioxin in structure and toxicity.

Studies of structurally related agents: Studies of 2,3,7,8- tetrachlorodibenzo-p-dioxin and a polybrominated biphenyl (PBB) mixture are summarized here because the pattern of tumors found by Brunner et al. (1996) mimics the tumors induced in rats by these structurally related agents. The National Toxicology Program (NTP, 1982) exposed groups of 50 male or female Osborne-Mendel rats by gavage to 0, 1.4, 7.1, or 71 ng/kg-day 2,3,7,8-tetrachlorodibenzo-p-dioxin for 2 years. Similar to the Brunner et al. (1996) study, liver tumors were increased in female rats and thyroid gland follicular cell tumors were increased in male rats. Mammary tumors were not, however, decreased in dosed female rats. In another study, NTP (1983) exposed groups of 51 male or female Fischer 344/N rats by gavage to 0, 0.1, 0.3, 1, 3, or 10 mg/kg-day of a PBB mixture ("Firemaster FF 1") for 6 months, then exposure was discontinued for 23 months before the animals were killed. Statistically significant increased incidences of liver tumors were found in male and female rats. Dose-related increased incidences of cholangiocarcinomas were found in male and female rats.

_II.B. Quantitative Estimate of Carcinogenic Risk from Oral Exposure

__II.B.1. Summary of Risk Estimates

Oral Slope Factor — See txt

Drinking Water Unit Risk — See txt

Extrapolation Method — Linear extrapolation below LED10s (U.S. EPA, 1996b)

Drinking Water Concentrations at Specified Risk Levels:

Risk Level	Concentration
E-4 (1 in 10,000)	See txt
E-5 (1 in 100,000)	See txt
E-6 (1 in 1,000,000)	See txt

__II.B.2. Dose-Response Data (Carcinogenicity, Oral Exposure)

Tumor Type — Liver hepatocellular adenomas, carcinomas, cholangiomas, or cholangiocarcinomas
Test animals — Female Sprague-Dawley rats
Route — Diet
Reference — Brunner et al., 1996; Norback and Weltman, 1985

	Administered Dose (ppm)	Human Equivalent Dose (mg/kg)/day	Tumor Incidence
Aroclor 1260	0 25 50 100	0 0.35 0.72 1.52	1/85 10/49 11/45 24/50
Aroclor 1254	0 25 50 100	0 0.35 0.76 1.59	1/85 19/45 28/49 28/49
Aroclor 1242	0 50 100	0 0.75 1.53	1/85 11/49 15/45

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Aroclor 1016	0 50 100 200	0 0.72 1.43 2.99	1/85 1/48 7/45 6/50
Aroclor 1260 (Norback and Weltman, 1985)	0 100/50/0	0.75 1.3	1/45 41/46

__II.B.3. Additional Comments (Carcinogenicity, Oral Exposure)

The cancer potency of PCB mixtures is determined using a tiered approach that depends on the information available. The following tier descriptions discuss all environmental exposure routes:

TIERS OF HUMAN SLOPE FACTORS FOR ENVIRONMENTAL PCBs

HIGH RISK AND PERSISTENCE

Upper-bound slope factor: 2.0 per (mg/kg)/day
Central-estimate slope factor: 1.0 per (mg/kg)/day

Criteria for use:
- Food chain exposure
- Sediment or soil ingestion
- Dust or aerosol inhalation
- Dermal exposure, if an absorption factor has been applied
- Presence of dioxin-like, tumor-promoting, or persistent congeners
- Early-life exposure (all pathways and mixtures)

LOW RISK AND PERSISTENCE

Upper-bound slope factor: 0.4 per (mg/kg)/day
Central-estimate slope factor: 0.3 per (mg/kg)/day

Criteria for use:
- Ingestion of water-soluble congeners
- Inhalation of evaporated congeners
- Dermal exposure, if no absorption factor has been applied

LOWEST RISK AND PERSISTENCE

Upper-bound slope factor: 0.07 per (mg/kg)/day
Central-estimate slope factor: 0.04 per (mg/kg)/day

Criteria for use: Congener or isomer analyses verify that congeners with more than 4 chlorines comprise less than 1/2% of total PCBs.

Slope factors are multiplied by lifetime average daily doses to estimate the cancer risk. SAMPLE CALCULATIONS ARE GIVEN IN U.S. EPA (1996a). Although PCB exposures are often characterized in terms of Aroclors, this can be both imprecise and inappropriate. Total PCBs or congener or isomer analyses are recommended.

When congener concentrations are available, the slope-factor approach can be supplemented by analysis of dioxin TEQs to evaluate dioxin-like toxicity. Risks from dioxin-like congeners (evaluated using dioxin TEQs) would be added to risks from the rest of the mixture (evaluated using slope factors applied to total PCBs reduced by the amount of dioxin-like congeners). SAMPLE CALCULATIONS ARE GIVEN IN U.S. EPA (1996a).

Depending on the specific application, either central estimates or upper bounds can be appropriate. Central estimates describe a typical individual's risk, while upper bounds provide assurance that this risk is not likely to be underestimated if the underlying model is correct. The upper bounds calculated in this assessment reflect study design and provide no information about sensitive individuals or groups. Central estimates are useful for estimating aggregate risk across a population. Central estimates are used for comparing or ranking environmental hazards, while upper bounds provide information about the precision of the comparison or ranking.

Some PCBs persist in the body and retain biological activity after exposure stops (Anderson et al., 1991a). Compared with the current default practice of assuming that less-than-lifetime effects are proportional to exposure duration, rats exposed to a persistent mixture (Aroclor 1260) had more tumors, while rats exposed to a less persistent mixture (Aroclor 1016) had fewer tumors (Brunner et al., 1996). Thus there may be greater-than- proportional effects from less-than-lifetime exposure, especially for persistent mixtures and for early-life exposures.

Highly exposed populations include some nursing infants and consumers of game fish, game animals, or products of animals contaminated through the food chain. Highly sensitive populations include people with decreased liver function and infants (Calabrese and Sorenson, 1977).

Because of the potential magnitude of early-life exposures (ATSDR, 1993; Dewailly et al., 1991, 1994), the possibility of greater perinatal sensitivity (Calabrese and Sorenson, 1977; Rao and Banerji, 1988), and the likelihood of interactions among thyroid and hormonal development, it is reasonable to conclude that early-life exposures may be associated with increased risks. Due to this potential for higher sensitivity early in life, the "high risk" tier is used for all early-life exposure.

It is crucial to recognize that commercial PCBs tested in laboratory animals were not subject to prior selective retention of persistent congeners through the food chain (that is, the rats were fed Aroclor mixtures, not environmental mixtures that had been bioaccumulated). Bioaccumulated PCBs appear to be more toxic than commercial PCBs (Aulerich et al., 1986; Hornshaw et al., 1983) and appear to be more persistent in the body (Hovinga et al., 1992). For exposure through the food chain, risks can be higher than those estimated in this assessment.

In calculating these estimates, administered doses were expressed as a lifetime daily average calculated from weekly body weight measurements and food consumption estimates (Keenan and Stickney, 1996). Doses were scaled from rats to humans using a factor based on the 3/4 power of relative body weight.

UNIT RISK ESTIMATE AND DRINKING WATER CONCENTRATIONS

For ingestion of water-soluble congeners, the middle-tier slope factor can be converted to a unit risk estimate and drinking water concentrations associated with specified risk levels.

Upper-bound slope factor: 0.4 per (mg/kg)/day
Upper-bound unit risk: 1 x 10-5 per ug/L

Drinking water concentration associated with a risk of:

1 in 10,000	10 ug/L
1 in 100,000	1 ug/L
1 in 1,000,000	0.1 ug/L

These estimates should not be used if drinking water concentrations exceed 1000 ug/L, since above this concentration the dose-response curve in the experimental range may provide better estimates.

For food chain exposure or ingestion that includes contaminated sediment or soil, the slope factor for "high risk and persistence" should be used instead.

__II.B.4. Discussion of Confidence (Carcinogenicity, Oral Exposure)

Joint consideration of cancer studies and environmental processes leads to a conclusion that environmental PCB mixtures are highly likely to pose a risk of cancer to humans. Although environmental mixtures have not been tested in cancer assays, this conclusion is supported by several complementary sources of information. Statistically significant, dose-related, increased incidences of liver tumors were induced in female rats by Aroclors 1260, 1254, 1242, and 1016 (Brunner et al., 1996). These mixtures contain overlapping groups of congeners that, together, span the range of congeners most frequently found in environmental mixtures. Several congeners have dioxin-like activity (Safe, 1994) and may promote tumors by different modes of action (Silberhorn et al., 1990); these congeners are found in environmental samples and in a variety of organisms, including humans (McFarland and Clarke, 1989).

The range of potency observed for commercial mixtures is used to represent the potency of environmental mixtures. The range reflects experimental uncertainty and variability of commercial mixtures, but not human heterogeneity or differences between commercial and environmental mixtures. Environmental processes alter mixtures through partitioning, transformation, and bioaccumulation, thereby decreasing or increasing toxicity. The overall effect can be considerable, and the range observed for commercial mixtures may underestimate the true range for environmental mixtures (Hutzinger et al., 1974; Callahan et al., 1979). Limiting the potency of environmental mixtures to the range observed for commercial mixtures reflects a decision to base potency estimates on experimental results, however uncertain, rather than apply safety factors to compensate for lack of information.

A tiered approach allows use of different kinds of information in estimating the potency of environmental mixtures. When congener information is limited, exposure pathway is used to indicate whether environmental processes have decreased or increased a mixture's potency. Partitioning, transformation, and bioaccumulation have been extensively studied (Hutzinger et al., 1974; Callahan et al., 1979) and can be associated with exposure pathway, thus the use of exposure pathway to represent environmental processes increases confidence in the risks inferred for environmental mixtures. For example, evaporated or dissolved congeners tend to be lower in chlorine content than the original mixture; they tend also to be more inclined to metabolism and elimination and lower in persistence and toxicity. On the other hand, congeners adsorbed to sediment or soil tend to be higher in chlorine content and persistence, and bioaccumulated congeners ingested through the food chain tend to be highest of all. Rates of these processes vary over several orders of magnitude (Hutzinger et al., 1974; Callahan et al., 1979). When available, congener information is an important tool for refining a potency estimate that was based on exposure pathway.

Extrapolation to environmental levels is based on models that are linear at low doses. Low-dose-linear models are appropriate when a carcinogen acts in concert with other exposures and processes that cause a background incidence of cancer (Crump et al, 1976; Lutz, 1990). Even when the mode of action indicates a nonlinear dose-response curve in homogeneous animal populations, the presence of genetic and lifestyle factors in a heterogeneous human population tends to make the dose-response curve more linear (Lutz, 1990). This is because genetic and lifestyle factors contribute to a wider spread of human sensitivity, which extends and straightens the dose-response curve over a wider range.

Uncertainty around these estimates extends in both directions. The slope factor ranges primarily reflect mixture variability, and so are not necessarily appropriate for probabilistic analyses that attempt to describe model uncertainty and parameter uncertainty. Estimates based on animal studies benefit from controlled exposures and absence of confounding factors; however, there is uncertainty in extrapolating dose and response rates across species. Information is lacking to evaluate high-to-low-dose differences. PCBs are absorbed through ingestion, inhalation, and dermal exposure, after which they are transported similarly through the circulation (ATSDR, 1993). This provides a reasonable basis for expecting similar internal effects from different routes of environmental exposure. Information on relative absorption rates suggests that differences in toxicity across exposure routes are small. The principal uncertainty, though, is using commercial mixtures to make inferences about environmental mixtures.

When exposure involves the food chain, uncertainty extends principally in one direction: through the food chain, living organisms selectively bioaccumulate persistent congeners, but commercial mixtures tested in laboratory animals were not subject to prior selective retention of persistent congeners. Bioaccumulated PCBs appear to be more toxic than commercial PCBs (Aulerich et al., 1986; Hornshaw et al., 1983) and appear to be more persistent in the body (Hovinga et al., 1992). For exposure through the food chain, risks can be higher than those estimated in this assessment. Two highly exposed populations, nursing infants and consumers of contaminated game animals, are exposed through the food chain.

The dioxin-like nature of some PCBs raises a concern for cumulative exposure, as dioxin-like congeners add to background exposure of other dioxin- like compounds and augment processes associated with dioxin toxicity. This weighs against considering PCB exposure in isolation or as an increment to a background exposure of zero. Confidence in this assessment's use of low-dose- linear models is enhanced when there is additivity to background exposures and processes (Crump et al, 1976; Lutz, 1990).

_II.C. Quantitative Estimate of Carcinogenic Risk from Inhalation Exposure

__II.C.1. Summary of Risk Estimates

Inhalation Unit Risk — See txt

Extrapolation Method — Linear extrapolation below LED10s (U.S. EPA, 1996b)

Air Concentrations at Specified Risk Levels:

Risk Level	Concentration
E-4 (1 in 10,000)	See txt
E-5 (1 in 100,000)	See txt
E-6 (1 in 1,000,000)	See txt

__II.C.2. Dose-Response Data for Carcinogenicity, Inhalation Exposure

See Dose-Response Data for oral exposure.

__II.C.3. Additional Comments (Carcinogenicity, Inhalation Exposure)

See Additional Comments for oral exposure.

For inhalation of evaporated congeners, the middle-tier slope factor can be converted to a unit risk estimate and ambient air concentrations associated with specified risk levels.

Upper-bound slope factor: 0.4 per (mg/kg)/day
Upper-bound unit risk: 1 x 10-4 per ug/cu.m

Ambient air concentration associated with a risk of:

1 in 10,000	1 ug/cu.m
1 in 100,000	0.1 ug/cu.m
1 in 1,000,000	0.01 ug/cu.m

These estimates should not be used if ambient air concentrations exceed 100 ug/cu.m, since above this concentration the dose-response curve in the experimental range may provide better estimates.

For inhalation of an aerosol or dust contaminated with PCBs, the slope factor for "high risk and persistence" should be used instead.

__II.C.4. Discussion of Confidence (Carcinogenicity, Inhalation Exposure)

See Discussion of Confidence for oral exposure. Information on relative absorption rates suggests that differences in toxicity across exposure routes are small.

_II.D. EPA Documentation, Review, and Contacts (Carcinogenicity Assessment)

__II.D.1. EPA Documentation

Source Document — U.S. EPA, 1996a [Available from the IRIS Hotline, Telephone: (202)566-1676; FAX (202)566-1749)].

The source document and IRIS Summary were considered at a public, external peer review workshop in May 1996. A workshop report was written by the review panel (U.S. EPA,

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1996c). All comments have been carefully evaluated and considered in this IRIS Summary. A record of these comments is summarized in the IRIS documentation files.

Other EPA Documentation — U.S. EPA, 1988

__II.D.2. EPA Review (Carcinogenicity Assessment)

Agency Work Group Review — 08/22/1996

Verification Date — 08/22/1996

__II.D.3. EPA Contacts (Carcinogenicity Assessment)

Please contact the IRIS Hotline for all questions concerning this assessment or IRIS, in general, at (202)566-1676 (phone), (202)566-1749 (FAX) or hotline.iris@epa.gov (internet address).

_III. [reserved]
_IV. [reserved]
_V. [reserved]

_VI. Bibliography

Substance Name — Polychlorinated biphenyls (PCBs)
CASRN — 1336-36-3
Last Revised — 11/01/1996

_VI.A. Oral RfD References

None

_VI.B. Inhalation RfC References

None

_VI.C. Carcinogenicity Assessment References

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_VII. Revision History

Substance Name — Polychlorinated biphenyls (PCBs)
CASRN — 1336-36-3

Date	Section	Description
05/01/1989	II.	Carcinogen summary on-line
01/01/1990	II.	Text edited
01/01/1990	VI.	Bibliography on-line
01/01/1992	IV.	Regulatory Action section on-line
06/01/1994	I.A.	Message only
01/01/1996	II.	Note added to assessment
10/01/1996	II.	File replaced; cancer potency of mixtures addressed
11/01/1996	VI.C.	References revised
04/01/1997	III., IV., V.	Drinking Water Health Advisories, EPA Regulatory Actions, and Supplementary Data were removed from IRIS on or before April 1997. IRIS users were directed to the appropriate EPA Program Offices for this information.
06/01/1997	II.C.3.	Units corrected in Upper-bound Unit Risk
01/02/1998	I.	This chemical is being reassessed under the IRIS Program.
09/04/2007	I.A.1.	Text edited

_VIII. Synonyms

Substance Name — Polychlorinated biphenyls (PCBs)
CASRN — 1336-36-3
Last Revised — -- 05/01/1989

- 1336-36-3
- AROCLOR
- AROCLOR 1221
- AROCLOR 1232
- AROCLOR 1242
- AROCLOR 1248
- AROCLOR 1254
- AROCLOR 1260
- AROCLOR 1262
- AROCLOR 1268
- AROCLOR 2565
- AROCLOR 4465
- AROCLOR 5442
- BIPHENYL, POLYCHLORO-
- CHLOPHEN
- CHLOREXTOL
- CHLORINATED BIPHENYL
- CHLORINATED DIPHENYL
- CHLORINATED DIPHENYLENE

- CHLORO BIPHENYL
- CHLORO 1,1-BIPHENYL
- CLOPHEN
- DYKANOL
- FENCLOR
- INERTEEN
- KANECHLOR
- KANECHLOR 300
- KANECHLOR 400
- MONTAR
- NOFLAMOL
- PCB
- PCBs
- PHENOCHLOR
- PHENOCLOR
- POLYCHLORINATED BIPHENYL
- Polychlorinated Biphenyls
- POLYCHLOROBIPHENYL
- PYRALENE
- PYRANOL
- SANTOTHERM
- SANTOTHERM FR
- SOVOL
- THERMINOL FR-1
- UN 2315

EXHIBIT 6 / PAGE 68

EXHIBIT 7

PCBs in Fish Caught in California:
Information for People Who Eat Fish

- PCBs are a large group of related industrial chemicals.
  - PCBs are oily liquids or solids and are clear or light yellow in color.
  - They have no smell or taste.
- PCBs are common contaminants in fish in many parts of the world.
- If PCBs levels in fish are high enough, they may pose a health threat to people that eat fish often.

The Office of Environmental Health Hazard Assessment (OEHHA) has issued health advisories for people who fish and their families. The advice tells how much of the contaminated fish can be eaten safely in areas where PCBs are found.

WHERE DO PCBS COME FROM?

- PCBs are man-made. They were made in the United States from about 1930 to 1977. They were used in:
  - Electrical transformers
  - Plastics and lubricating oils
- PCBs were banned for most uses because they do not break down easily and stay in the environment for a long time.

Spills, leaks, and improper disposal are the main ways that PCBs have entered the environment.

When PCBs get into air, they can be carried thousands of miles. PCBs also enter soil and water.

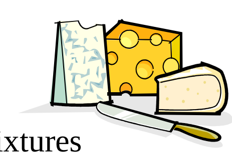
HOW MIGHT I BE EXPOSED TO PCBS?

PCBs are mainly found in:

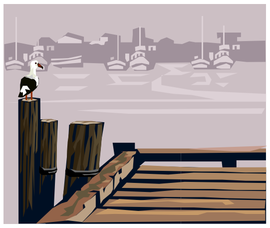
- soil and sediment
- fatty parts of fish, meat, and dairy products

Fish and shellfish usually contain the highest PCB levels of any food, especially fish that:

- are fatty
- eat many other fish
- are caught near industrial areas



People may also be exposed to small amounts of PCBs from fluorescent light fixtures or electrical appliances more than 30 years old. People who work with PCB transformers, breathe the air near hazardous waste sites, or drink water from a PCB-contaminated well can also be exposed. Mothers can pass PCBs to their babies during pregnancy or in breast milk. But exposure to PCBs has decreased since they were banned in 1977.



WHERE HAVE HIGH LEVELS OF PCBS BEEN FOUND IN FISH IN CALIFORNIA?

High levels of PCBs have been found in some species of fish in or near San Francisco Bay, Santa Monica Bay, the Palos Verdes Peninsula, San Pedro Bay, and Long Beach Harbor.

OEHHA has fish advisories for these locations based on PCB levels in certain kinds of fish.

- The highest PCB levels have been found in white croaker, a fatty fish.
- The advice tells you how much you can safely eat of each fish species at each place.
- The advisories are printed in the California Sport Fishing Regulations booklets.

Although PCB levels in fish have been decreasing since they were banned, scientists may still find PCBs in fish from other areas of the state that have not yet been tested.

HOW CAN PCBS AFFECT HEALTH?

In the past, some people were exposed to very high levels of PCBs at work or from accidental poisoning. These people showed harmful health effects to their skin, eyes, and nerves.

Studies with animals showed that high levels of PCBs could harm the liver, digestive tract, and nerves; and could affect development, reproduction, and the immune system.

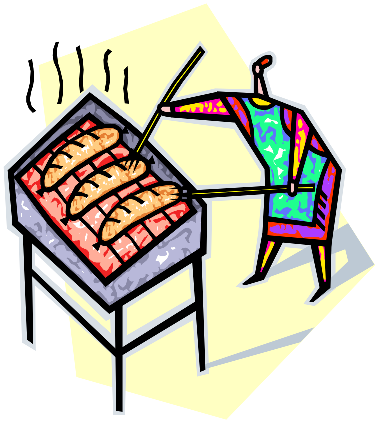
PCBs have also been found to cause cancer in some animal studies. The state of California and the United States Environmental Protection Agency say that PCBs probably can cause cancer in humans.

PCB levels in fish are much lower than levels that may have made people sick in the past from work or accidental poisonings. PCB levels in fish also are much lower than levels given to laboratory animals.

Some studies suggest that low levels of PCBs, like those found in some fish, might cause small decreases in children's' I.Q. or affect their memory, especially if exposures occur during pregnancy. Other studies have not confirmed these effects.

CAN PCB POISONING HAPPEN FROM EATING FISH CAUGHT IN CALIFORNIA?

- It is very unlikely that you will have any obvious signs of harm from PCBs.
- Fish advisories can help you prevent PCBs from building up in your body to levels that could cause health problems or increase your chance of getting cancer.

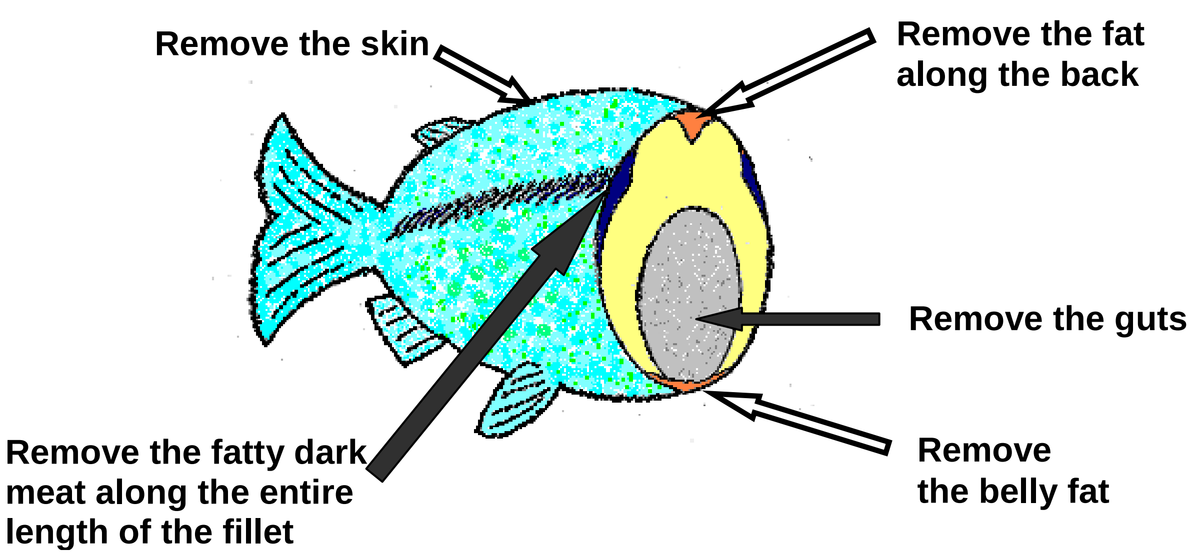


IS THERE A WAY TO MAKE FISH SAFER TO EAT?

A large amount of PCBs can be removed from fish if you cook and clean them in certain ways.

- OEHHA recommends that you clean and gut the fish you catch before cooking it. Some chemicals, including PCBs, build up in the organs, especially in the liver.
- PCBs are stored mainly in the fat. So you can lower the amount of PCBs in fish by getting rid of the fat. You should trim the fat, remove the skin, and fillet the fish before cooking.
- It is better not to use the fat, skin, organs, juices, (or whole fish) in soups or stews.

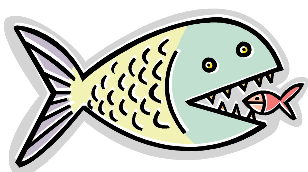
- Fat is in the back and the belly and in the dark meat along the side of the fish.
- When you remove the skin, you also remove a thin layer of fat under the skin.
  - You should bake or grill fish in a way that lets the juices drain away. Then you should throw away the cooking juices.
  - You can get rid of about half of the PCBs in fish by using these methods.
  - If you do eat the skin, fat, or liver, you will be exposed to more PCBs.
- If you eat crabs or lobsters, you should not eat the soft green parts because PCBs can build up there.



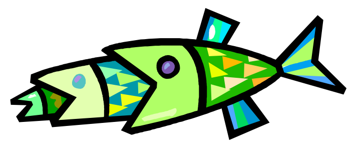
WHAT ELSE CAN I DO?

OEHHA recommends that you fish in different places in case the spot where you usually fish is more contaminated.

It is generally a good idea to eat a mix of different kinds of fish.



Fish that eat other fish often have the most PCBs and other chemicals.



Younger fish usually have less PCBs than larger older fish. It is better to eat smaller younger fish.

WHERE CAN I GET MORE INFORMATION?

Health advisories for sport fish in all parts of California are printed in the California Sport Fishing Regulations booklet. This booklet can be found where fishing licenses are sold.

You can also get updates and other information on fish advisories or “safe eating guidelines” from OEHHA at www.oehha.ca.gov/fish.html. Or call (916) 327-7319 or (510) 622-3170.

More information on PCBs is available at http://www.atsdr.cdc.gov/toxprofiles/tp17.html.

EXHIBIT 8

Public Health Response to Reported Concerns About Cancer

Cyrus Rangan, M.D., F.A.A.P., F.A.C.M.T.
Marita Santos, R.N., M.S.N.

County of Los Angeles Public Health

Investigating a Reported "Cluster"

1. Gather background information
2. Administer survey
3. Review scientific literature
4. Consult Cancer Registry
5. Determine whether true cluster exists

County of Los Angeles Public Health

Malibu High School

33 COMPLETED SURVEYS

- 27 Current Staff + 6 Retired Staff
- Age Range: 30-75 years old
- Ethnicity: 91% Caucasian, 3% Latino & 6% African American
- Few reports of a cancer diagnosis, consisting of different types of cancers

COUNTY OF LOS ANGELES Public Health

Cabrillo Elementary School

11 COMPLETED SURVEYS

- 10 Current Staff + 1 Retired Staff
- Age Range: 40-77 years old
- Ethnicity: 91% Caucasian and 9% Latino
- Few reports of a cancer diagnosis, consisting of different types of cancers

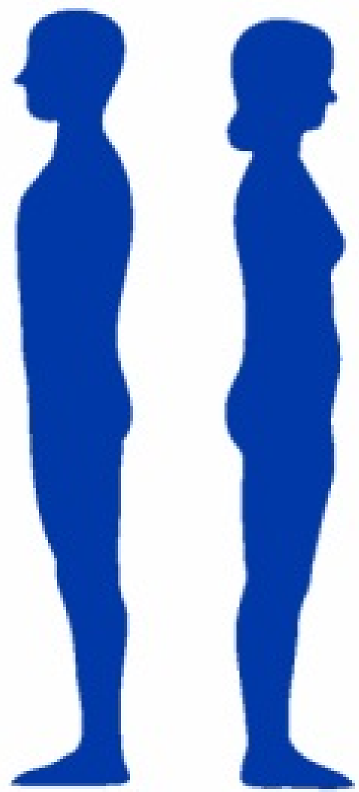
COUNTY OF LOS ANGELES Public Health

Thyroid Cancer

- 1% of all cancers in the U.S.
- Incidence rates 2 to 3 times higher in women. (45,000 out of 60,000 per year, and increasing)
- Within "thyroid cancer" there are many variants: (papillary, follicular, medullary, anaplastic)
- Higher rates seen in:
  - Iceland
  - Hawaii
  - Philippines (also Filipino immigrant population)

Estimated New Cancer Cases* in the US in 2013

Men 854,790		Women 805,500	
Prostate	28%	29%	Breast
Lung & bronchus	14%	14%	Lung & bronchus
Colon & rectum	9%	9%	Colon & rectum
Urinary bladder	6%	6%	Uterine corpus
Melanoma of skin	5%	6%	Thyroid
Kidney & renal pelvis	5%	4%	Non-Hodgkin lymphoma
Non-Hodgkin lymphoma	4%	4%	Melanoma of skin
Oral cavity	3%	3%	Kidney & renal pelvis
Leukemia	3%	3%	Pancreas
Pancreas	3%	3%	Ovary
All Other Sites	20%	19%	All Other Sites



*Excludes basal cell and squamous cell skin cancers and in situ carcinoma except urinary bladder.

Source: American Cancer Society, Cancer Facts & Figures "Cancer Statistics 2013"
http://www.cancer.org/research/cancerfactsstatistics/cancerfactsfigures2013/index

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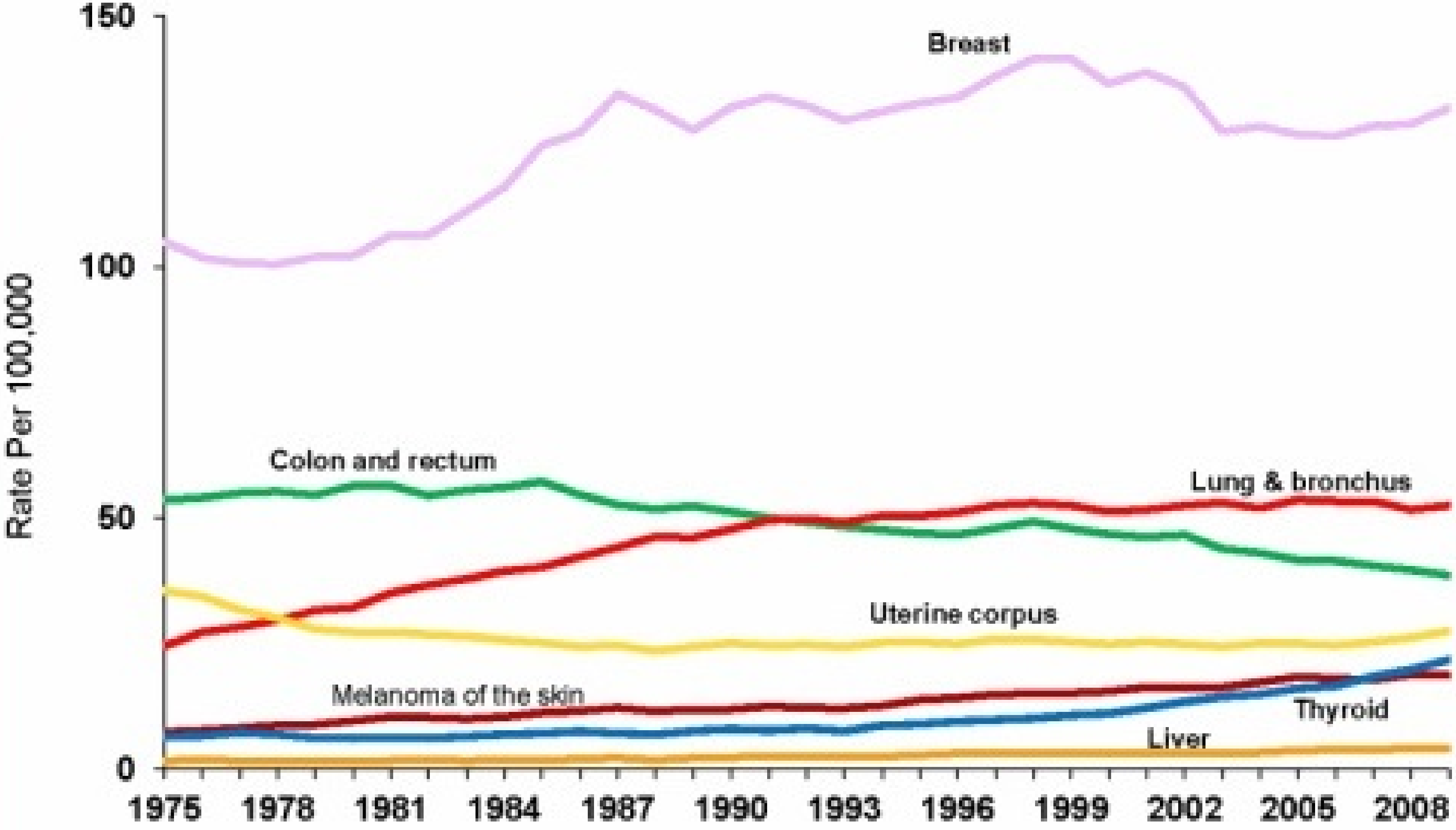
Cancer Incidence Rates* Among Women, US, 1975-2009



*Age-adjusted to the 2000 US standard population and adjusted for delays in reporting.
Source: Surveillance, Epidemiology, and End Results Program, Delay-adjusted Incidence database: SEER Incidence Delay-adjusted Rates, 9 Registries, 1975-2009, National Cancer Institute, 2012.

Risk Factors for Thyroid Cancer

- High-dose exposure to ionizing radiation:
  - Radiation treatment for medical conditions or dental work
- Iodine Deficiency
- Obesity
- Family history

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Risk Factors for Thyroid Cancer

- History of thyroid conditions:
  - Goiter
  - Benign thyroid nodules/adenomas
  - Thyroiditis/Hashimoto's Thyroiditis
  - Cowden Disease

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California Teachers Study

- Cohort of active and retired female teachers and administrators, 1995-2008 (n=117,646)
- Increased risk of thyroid cancer for:
  - Later menses (≥14 years)
  - Longer menstrual cycles (>30 days)
  - Recent pregnancy (within past 5 years)

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Defining *Cancer*

Context with other diseases

- Different infections have different causes and different courses of treatment

- Different types of cancer diagnoses have:
  - Different causes
  - Different courses of treatment
  - Different rates of occurrence
  - Different chances for survival

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Facts About Cancer<u>s</u>

- Cancer<u>s</u> are a group of more than 100 diseases characterized by uncontrolled growth and spread of abnormal cells

- The term *cancer* has been used to describe all of these diseases, leading to the viewpoint of cancer as a single disease

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Facts About Cancers

- Cancers are more common than most people realize
  - Cancers are now the leading cause of death in the U.S. in people under age 80
  - Approx. 30-40% of Americans will get a cancer at some point in their lives
  - Cancers will strike 3 out of 4 families

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Facts About Cancers

- Diagnosis of a cancer increases with age and medical care advances
  - More Americans are leading longer and healthier lives, and surviving into their later years, so we expect to see more cancers in our rapidly aging population
  - Increased awareness, screening, and development of diagnostic techniques contribute to increased incidence and prevalence of some cancers

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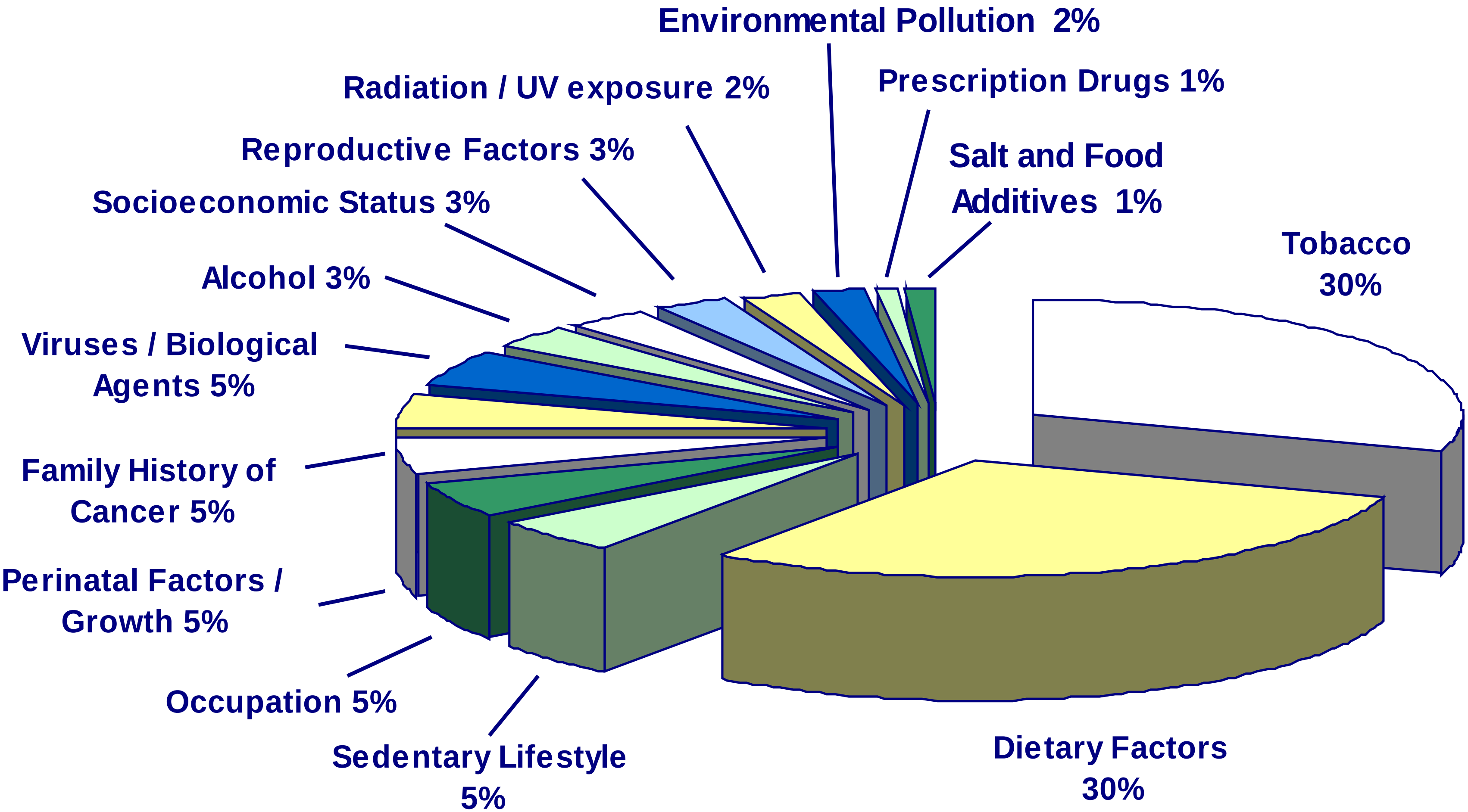
Causes of Cancer in the U.S.



Source: Harvard Report on Cancer Prevention, 1996

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What is a Cancer Cluster?

- A *cancer cluster* is the occurrence of a greater than expected number of cases of cancer within a group of people, a geographic area, or a period of time

Source: National Cancer Institute

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Perceived Cancer Cluster

- What the public *perceives* is a cluster of cancer is different from how scientists define it
- A community's perception may reflect an elevated rate of cancer, or it may not

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Cluster Characteristics

- People living in the same area may have commonalities based on where they live.

- Examples:

  - Non-Hodgkin's lymphoma in West Hollywood
  - Breast cancer in Beverly Hills
  - Stomach cancer in East Los Angeles, Koreatown and Chinatown

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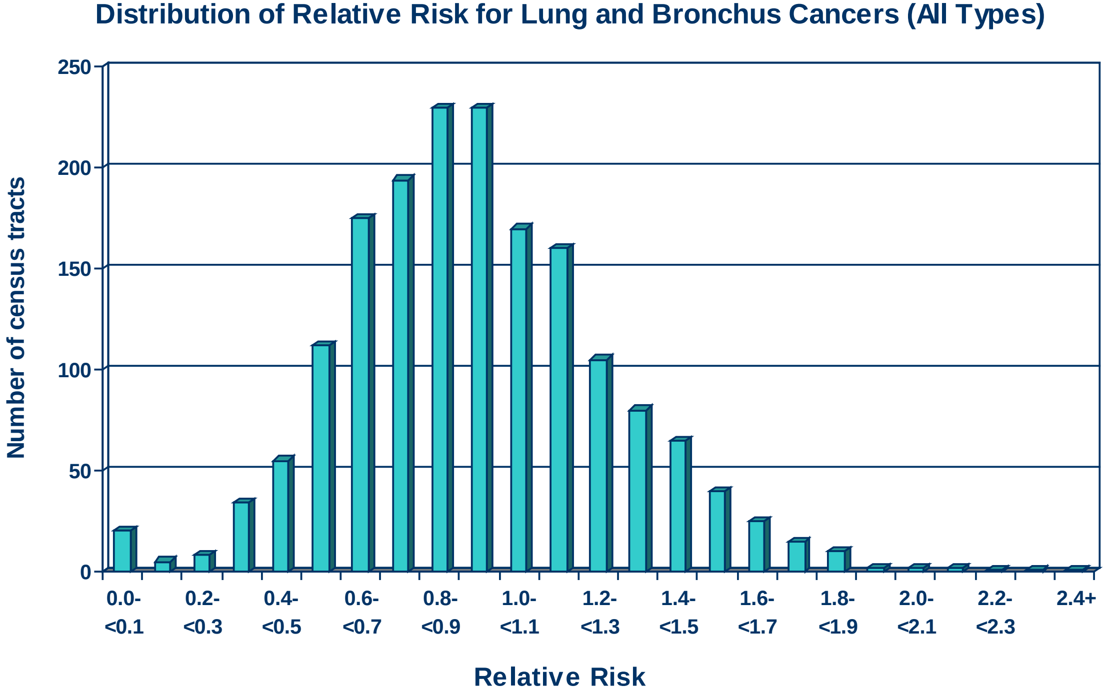
Comparing Cancer Rates



Addressing Concerns

- Cancer clusters are a real phenomenon.
- However, 85% of reported *cancer clusters* show no actual elevations in cancer rates
- They only appear to be clusters because of common misconceptions about cancers

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Misconceptions

- People have a tendency to see patterns in random events
- Truly random patterns often don't appear random to us
- "Law of Small Numbers"
- "Texas Sharpshooter Fallacy"

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Criteria for a Cancer Cluster

- 10-1,000 times higher rate of cancer
  - E.g. Leukemia & radiation from Chernobyl
- Rare type of cancer
  - E.g. Mesothelioma & asbestos
- Cancer seen in new age group
  - E.g. Cervical cancer & diethylstilbestrol (DES)

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What does this mean for Malibu?

- Common cancers
- Common age groups
- No evidence of meaningful cluster in Malibu vicinity

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Papillary Carcinoma of the Thyroid

Figure 9: Map of census tracts at high risk.

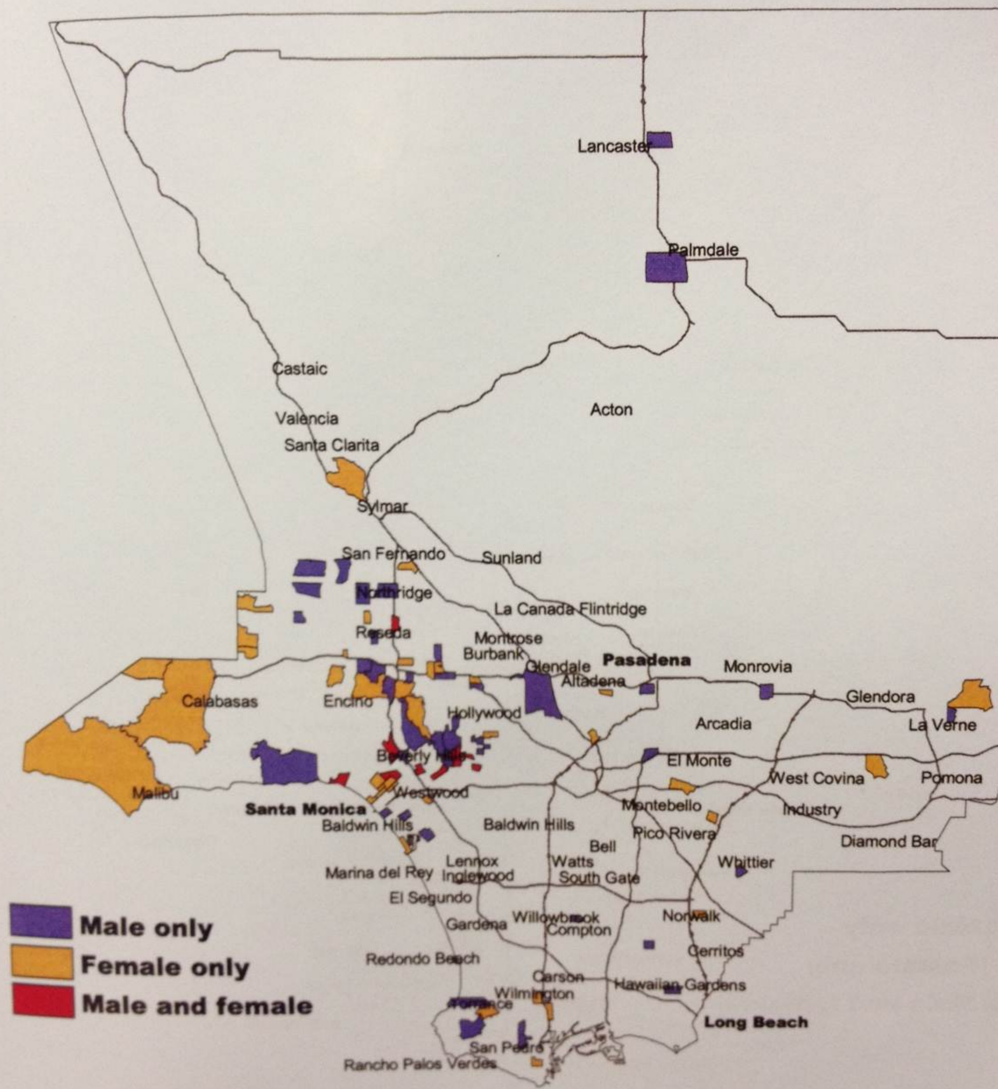

Figure 10: Male-female correlation between the relative risks for high-risk census tracts.

Map of Census Tracts at High Risk in L.A. County

Source: Cancers in the Urban Environment, Mack, T., 2004

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Figure 11: Map of census tracts at high risk, adjusted for social class.

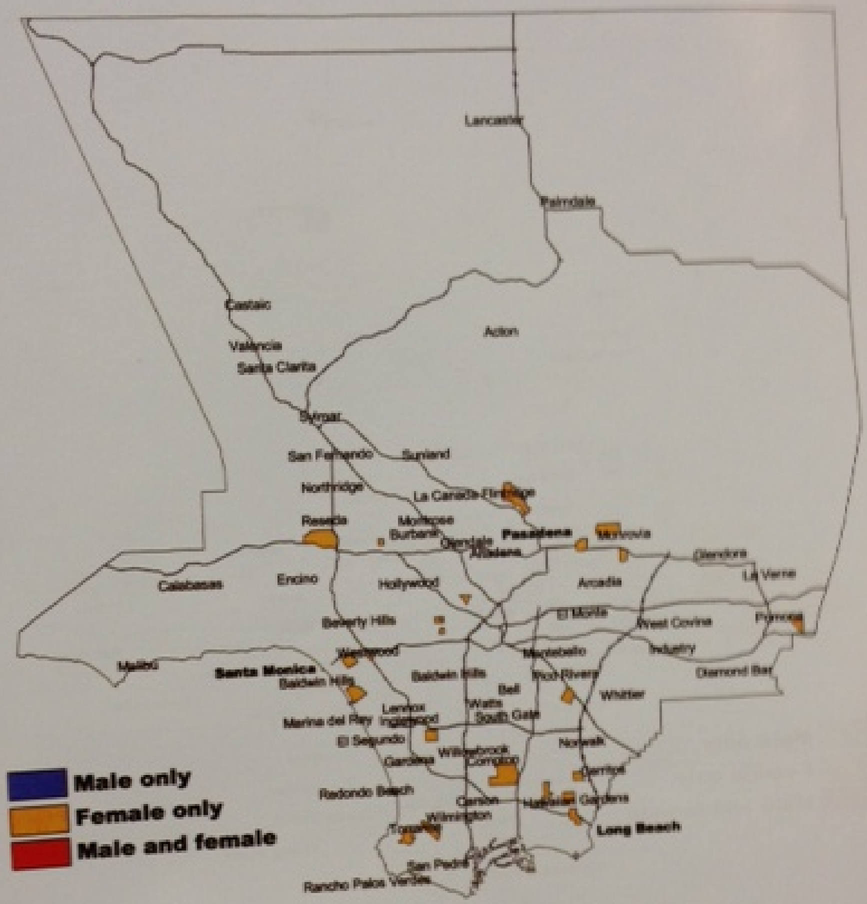
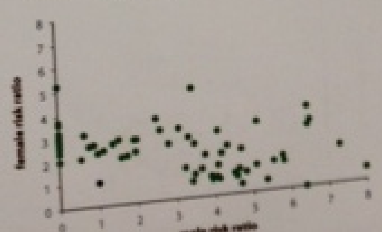


Figure 12: Male-female correlation between the relative risks for high-risk census tracts, adjusted for social class.



Map of Census Tracts at High Risk in L.A. County, adjusted for Social Class

Source: Cancers in the Urban Environment, Mack, T., 2004

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Environmental Link to Cancer?

- Numerous substances have been identified by scientific agencies as potential carcinogens
- May be responsible for any individual's cancer
- Despite lack of a cluster, it is still difficult to tie any individual's cancer diagnosis to an environmental source

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Environmental Link to Cancer?

- If you have mesothelioma, there is virtually a 100% chance that asbestos is the cause
- If you have cervical cancer, there is a very high chance that HPV is the major cause
- For most other cancers, the causes are multifactorial

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Environmental Link to Cancer?

- Known human carcinogens: asbestos, arsenic, benzene, ionizing radiation, inhaled hexavalent chromium, vinyl chloride
- Circumstances of exposure influence the contribution of these factors

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Public Health

Environmental Link to Cancer?

- Known: *sufficient evidence of carcinogenicity* in humans
- Probable: *limited evidence of carcinogenicity* in humans and *sufficient evidence of carcinogenicity* in experimental animals
- Possible: *limited evidence of carcinogenicity* in humans and less than *sufficient evidence of carcinogenicity* in experimental animals, or *inadequate evidence of carcinogenicity* in humans but there is *sufficient evidence of carcinogenicity* in experimental animals

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What about PCBs?

- PCBs "upgraded" from probable to known in March 2013
- Based on epidemiological association between PCB exposure and increased risk of melanoma in humans. Limited evidence from small studies suggesting increased risks of non-Hodgkin lymphoma and breast cancer
- Liver cancer in rats

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What about PCBs?

- Most consistent human disease finding with PCB exposure is chloracne
- More research is needed on PCBs to determine potential human impact

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Should I be worried about PCBs at Malibu?

- Studies are based on plausible mechanisms of exposure (ingestion) and potential accumulation of PCBs over time

- Chronic inhalation in workers associated with respiratory tract symptoms, such as cough and tightness of the chest, gastrointestinal effects including anorexia, weight loss, nausea, vomiting, and abdominal pain, mild liver effects, and effects on the skin and eyes, such as chloracne, skin rashes, and eye irritation

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Should I be worried about PCBs at Malibu?

- Environmental testing at Malibu has revealed the presence of PCBs in caulking
- Lack of data to determine contribution to overall PCB exposure

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Should I be worried about PCBs at Malibu?

- Link between PCB exposure to human disease at Malibu can not and should not be determined by environmental testing
- Testing begets testing. Good scientific methods suggest the need for endpoints

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Should I be worried about PCBs at Malibu?

- DPH does not find evidence of unusual cancer rates or occurrences at Malibu
- DPH does not recommend further testing of the school environment to establish correlations with human disease

Contact Information

Los Angeles County Department of Public Health

Environmental Health

Toxics Epidemiology Program

Phone: (213) 738-3220

Email: tox@ph.lacounty.gov

Website:

http://publichealth.lacounty.gov/eh/TEA/ToxicEpi/index_ToxicsEpi.htm

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References

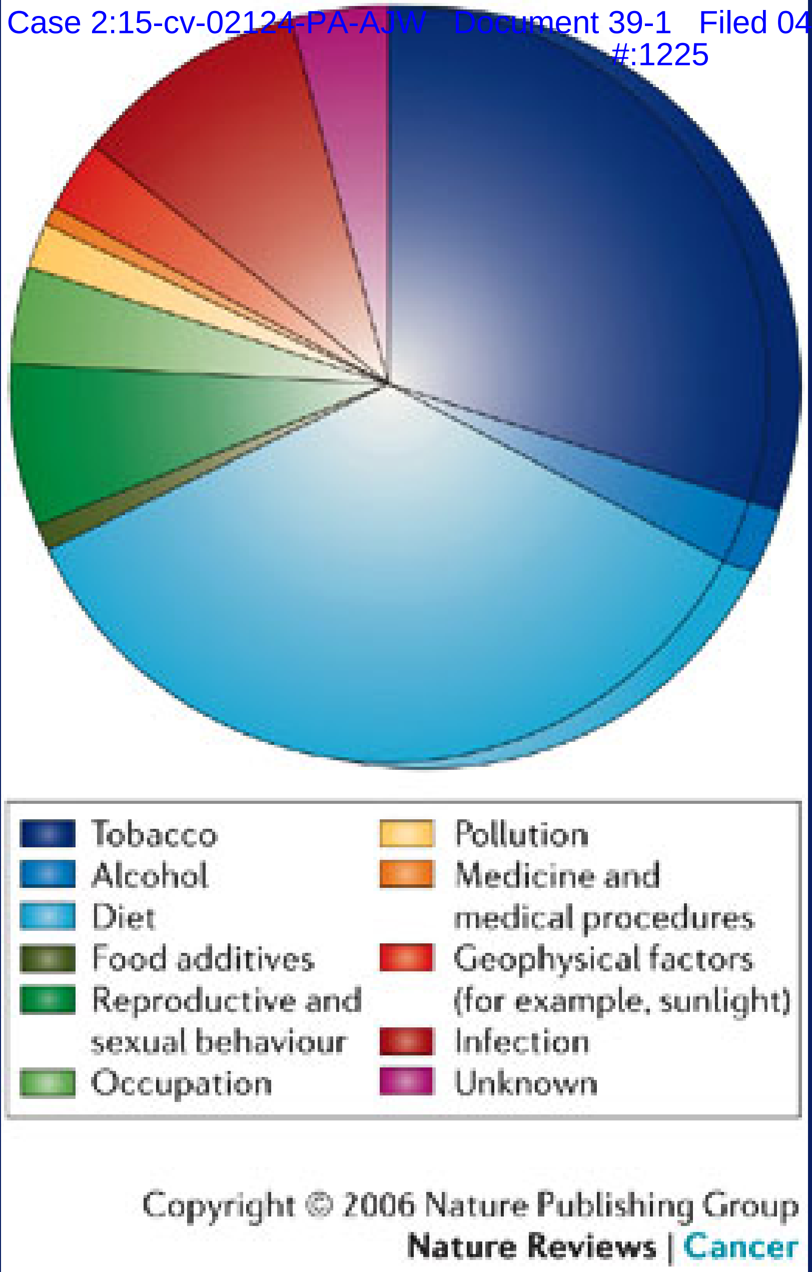
- USC Cancer Registry/Los Angeles Cancer Surveillance Program http://uscnorriscancer.usc.edu/about/programs/la_county.html
- National Cancer Institute

  http://www.cancer.gov/
- California Teachers Study

  http://calteachersstudy.org/

Q & A

Causes of Cancer in the U.S.



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Public Health

EXHIBIT 9

American Cancer Society® THE OFFICIAL SPONSOR OF BIRTHDAYS®

PRINT CLOSE

1-800-227-2345 | www.cancer.org

Lifetime Risk of Developing or Dying From Cancer

The lifetime risk of developing or dying from cancer refers to the chance a person has, over the course of his or her lifetime (from birth to death), of being diagnosed with or dying from cancer. These risk estimates, like annual incidence and mortality data, provide another measure of how widespread cancer is in the United States.

The following tables list lifetime risks of developing and dying from certain cancers for men and women. The information is from the US National Cancer Institute's Surveillance Epidemiology and End Results (SEER) Database, and is based on incidence and mortality data for the United States from 2009 through 2011, the most current years for which data are available.

The risk is expressed both in terms of a percentage and as odds. For example, the risk that a man will develop bladder cancer during his lifetime is 3.83%. This means he has about 1 chance in 26 of developing bladder cancer (100/3.83 = 26.1). Put another way, 1 out of every 26 men in the United States will develop bladder cancer during his lifetime.

These numbers are average risks for the overall US population. Your risk may be higher or lower than these numbers, depending on your particular risk factors.

Males

	Risk of developing		**Risk of dying from**	
	%	**1 in**	**%**	**1 in**
All invasive sites	**43.31**	**2**	**22.83**	**4**
Bladder (includes in situ)	3.83	26	0.91	110
Brain and nervous system	0.69	145	0.51	196
Breast	0.13	769	0.03	3,333
Colon and rectum	4.84	21	2.04	49
Esophagus	0.80	125	0.79	127
Hodgkin disease	0.24	417	0.05	2,000

Kidney and renal pelvis	2.04	49	0.61	164
Larynx (voice box)	0.59	169	0.20	500
Leukemia	1.70	59	1.03	97
Liver and bile duct	1.27	79	0.90	111
Lung and bronchus	7.43	13	6.47	15
Melanoma of the skin	2.56	39	0.43	233
Multiple myeloma	0.83	120	0.47	213
Non-Hodgkin lymphoma	2.36	42	0.87	115
Oral cavity and pharynx	1.55	65	0.39	256
Pancreas	1.52	66	1.35	74
Prostate	15.02	7	2.66	38
Stomach	1.08	93	0.49	204
Testicles	0.38	263	0.02	5,000
Thyroid	0.57	175	0.05	2,000

Females

	Risk of developing		Risk of dying from	
	%	**1 in**	**%**	**1 in**

All invasive sites	**37.81**	**3**	**19.26**	**5**
Bladder (includes in situ)	1.14	88	0.34	294
Brain and nervous system	0.55	182	0.40	250
Breast	12.33	8	2.72	37
Cervix	0.65	154	0.23	435
Colon and rectum	4.49	22	1.85	54
Esophagus	0.23	435	0.21	476
Hodgkin disease	0.20	500	0.03	3,333
Kidney and renal pelvis	1.19	84	0.35	286
Larynx (voice box)	0.13	769	0.05	2,000
Leukemia	1.19	84	0.72	139
Liver and bile duct	0.53	189	0.47	213
Lung and bronchus	6.17	16	4.95	20
Melanoma of the skin	1.61	62	0.21	476
Multiple myeloma	0.62	161	0.38	263
Non-Hodgkin lymphoma	1.91	52	0.69	145
Oral cavity and pharynx	0.67	149	0.18	556

Ovary	1.33	75	0.98	102
Pancreas	1.48	68	1.32	76
Stomach	0.67	149	0.33	303
Thyroid	1.68	60	0.07	1,429
Uterine corpus	2.73	37	0.57	175

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Last Medical Review: 09/24/2014
Last Revised: 10/01/2014

EXHIBIT 10

Thyroid Cancer

What is cancer?

The body is made up of hundreds of millions of living cells. Normal body cells grow, divide to make new cells, and die in an orderly fashion. During the early years of a person's life, normal cells divide faster to allow the person to grow. After the person becomes an adult, most cells divide only to replace worn-out or dying cells or to repair injuries.

Cancer begins when cells in a part of the body start to grow out of control. There are many kinds of cancer, but they all start because of out-of-control growth of abnormal cells.

Cancer cell growth is different from normal cell growth. Instead of dying, cancer cells continue to grow and form new, abnormal cells. Cancer cells can also invade (grow into) other tissues, something that normal cells cannot do. Growing out of control and invading other tissues are what makes a cell a cancer cell.

Cells become cancer cells because of damage to DNA. DNA is in every cell and directs all its actions. In a normal cell, when DNA gets damaged the cell either repairs the damage or the cell dies. In cancer cells, the damaged DNA is not repaired, but the cell doesn't die like it should. Instead, this cell goes on making new cells that the body does not need. These new cells will all have the same damaged DNA as the first cell does.

People can inherit damaged DNA, but most DNA damage is caused by mistakes that happen while the normal cell is reproducing or by something in our environment. Sometimes the cause of the DNA damage is something obvious, like cigarette smoking. But often no clear cause is found.

In most cases the cancer cells form a tumor. Some cancers, like leukemia, rarely form tumors. Instead, these cancer cells involve the blood and blood-forming organs and circulate through other tissues where they grow.

Cancer cells often travel to other parts of the body, where they begin to grow and form new tumors that replace normal tissue. This process is called *metastasis*. It happens when the cancer cells get into the bloodstream or lymph vessels of our body.

No matter where a cancer may spread, it is always named for the place where it started. For example, breast cancer that has spread to the liver is still called breast cancer, not liver cancer. Likewise, prostate cancer that has spread to the bone is metastatic prostate cancer, not bone cancer.

Different types of cancer can behave very differently. For example, lung cancer and breast cancer are very different diseases. They grow at different rates and respond to different treatments. That is why people with cancer need treatment that is aimed at their particular kind of cancer.

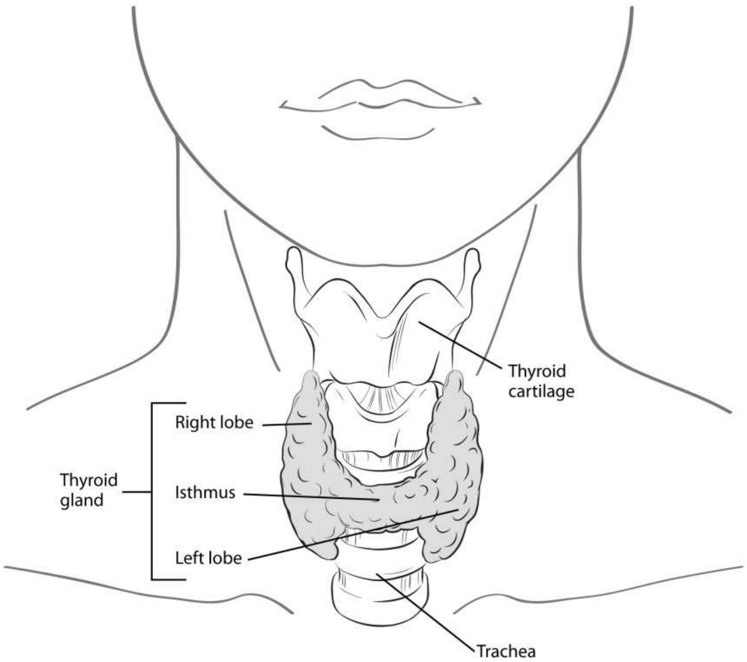
Not all tumors are cancerous. Tumors that aren't cancer are called *benign*. Benign tumors can cause problems – they can grow very large and press on healthy organs and tissues. But they cannot grow into (invade) other tissues. Because they can't invade, they also can't spread to other parts of the body (metastasize). These tumors are almost never life threatening.

What is thyroid cancer?

Thyroid cancer is a cancer that starts in the thyroid gland. To understand thyroid cancer, it helps to know about the normal structure and function of the thyroid gland.

The thyroid gland

The thyroid gland is below the thyroid cartilage (Adam's apple) in the front part of the neck. In most people, the thyroid cannot be seen or felt. It is butterfly shaped, with 2 lobes — the right lobe and the left lobe — joined by a narrow isthmus (see picture below).



The thyroid gland has 2 main types of cells:

- **Follicular cells** use iodine from the blood to make thyroid hormones, which help regulate a person's metabolism. Having too much thyroid hormone (a condition called *hyperthyroidism*) can cause a rapid or irregular heartbeat, trouble sleeping, nervousness, hunger, weight loss, and a feeling of being too warm. Having too little hormone (called *hypothyroidism*) causes a person to slow down, feel tired, and gain weight. The amount of thyroid hormone released by the thyroid is regulated by the pituitary gland at the base of the brain, which makes a substance called *thyroid-stimulating hormone* (TSH).
- **C cells** (also called *parafollicular cells*) make calcitonin, a hormone that helps control how the body uses calcium.

Other, less common cells in the thyroid gland include immune system cells (lymphocytes) and supportive (stromal) cells.

Different cancers develop from each kind of cell. The differences are important because they affect how serious the cancer is and what type of treatment is needed.

Many types of growths and tumors can develop in the thyroid gland. Most of these are benign (non-cancerous) but others are malignant (cancerous), which means they can spread into nearby tissues and to other parts of the body.

Benign thyroid enlargement and nodules

Changes in the thyroid gland's size and shape can often be felt or even seen by patients or by their doctor.

The medical term for an abnormally large thyroid gland is *goiter*. Some goiters are diffuse, meaning that the whole gland is large. Other goiters are nodular, meaning that the gland is large and has one or more nodules (bumps) in it. There are many reasons the thyroid gland might be larger than usual, and most of the time it is not cancer. Both diffuse and nodular goiters are usually caused by an imbalance in certain hormones. For example, not getting enough iodine in the diet can cause changes in hormone levels and lead to a goiter.

Lumps or bumps in the thyroid gland are called *thyroid nodules*. Most thyroid nodules are benign, but about 1 in 20 is cancerous (see the next section). Sometimes these nodules make too much thyroid hormone and cause hyperthyroidism.

People can develop thyroid nodules at any age, but they occur most commonly in older adults. Fewer than 1 in 10 adults have thyroid nodules that can be felt by a doctor. But when the thyroid is looked at using ultrasound, many more people are found to have nodules that are too small to feel.

Most nodules are cysts filled with fluid or with a stored form of thyroid hormone called *colloid*.

Solid nodules have little fluid or colloid. These nodules are more likely to be cancerous than are fluid-filled nodules. Still, most solid nodules are not cancer. Some types of solid nodules, such as hyperplastic nodules and adenomas, have too many cells, but the cells are not cancer cells.

Benign thyroid nodules sometimes can be left alone (not treated) as long as they're not growing or causing symptoms. Others may require some form of treatment.

Malignant (cancerous) thyroid tumors

There are several types of thyroid cancer.

Differentiated thyroid cancers

Most thyroid cancers are differentiated cancers. In these cancers, the cells look a lot like normal thyroid tissue when seen under a microscope. These cancers develop from thyroid follicular cells.

Papillary carcinoma: About 8 out of 10 thyroid cancers are papillary carcinomas (also called *papillary cancers* or *papillary adenocarcinomas*). Papillary carcinomas tend to grow very slowly and usually develop in only one lobe of the thyroid gland. Even though they grow slowly, papillary carcinomas often spread to the lymph nodes in the neck. Still, these cancers can often be treated successfully and are rarely fatal.

There are several subtypes of papillary carcinoma. Of these, the follicular subtype (also called *mixed papillary-follicular variant*) occurs most often. The usual form of papillary carcinoma and the follicular subtype have the same good outlook (prognosis) when found early, and they are treated the same way. Other subtypes of papillary carcinoma (columnar, tall cell, insular, and diffuse sclerosing) are not as common and tend to grow and spread more quickly.

Follicular carcinoma: Follicular carcinoma, also called *follicular cancer* or *follicular adenocarcinoma*, is the next most common type, making up about 1 out of 10 thyroid cancers. It is more common in countries where people don't get enough iodine in their diet. These cancers usually do not spread to lymph nodes, but they can spread to other parts of the body, such as the lungs or bones. The outlook (prognosis) for follicular carcinoma is not quite as good as that of papillary carcinoma, although it is still very good in most cases.

Hürthle (Hurthle) cell carcinoma, also known as *oxyphil cell carcinoma*, is actually a variant of follicular carcinoma. It accounts for about 3% of thyroid cancers. The prognosis may not be as good as that of typical follicular carcinoma because this type is harder to find and treat. This is because it is less likely to absorb radioactive iodine, which is used both for treatment and to look for the spread of differentiated thyroid cancer.

Other types of thyroid cancers

These thyroid cancers occur less often than differentiated thyroid cancers.

Medullary thyroid carcinoma: Medullary thyroid carcinoma (MTC) accounts for about 4% of thyroid cancers. It develops from the C cells of the thyroid gland, which normally make calcitonin, a hormone that helps control the amount of calcium in blood. Sometimes this cancer can spread to lymph nodes, the lungs, or liver even before a thyroid nodule is discovered.

Medullary thyroid cancers often release too much calcitonin and a protein called *carcinoembryonic antigen (CEA)* into the blood. These substances can be detected with blood tests.

Because MTC does not absorb or take up radioactive iodine (used for treatment and to find metastases of differentiated thyroid cancer), the prognosis (outlook) is not quite as good as that for differentiated thyroid cancers. There are 2 types of MTC:

- **Sporadic MTC**, which accounts for about 8 out of 10 cases of MTC, is not inherited (meaning it does not run in families). It occurs mostly in older adults and affects only one thyroid lobe.

- **Familial MTC** is inherited and can occur in each generation of a family. These cancers often develop during childhood or early adulthood and can spread early. Patients usually have cancer in several areas of both lobes. Familial MTC is often linked with an increased risk of other types of tumors. This is described in more detail in the section "What are the risk factors for thyroid cancer?"

Anaplastic carcinoma: Anaplastic carcinoma (also called *undifferentiated carcinoma*) is a rare form of thyroid cancer, making up about 2% of all thyroid cancers. It is thought to sometimes develop from an existing papillary or follicular cancer. This cancer is called *undifferentiated* because the cancer cells do not look very much like normal thyroid cells under the microscope. This cancer often spreads quickly into the neck and to other parts of the body, and is very hard to treat.

Thyroid lymphoma: Lymphoma is very uncommon in the thyroid gland. Lymphomas are cancers that develop from lymphocytes, the main cell type of the immune system. Most lymphocytes are found in lymph nodes, which are pea-sized collections of immune cells scattered throughout the body (including the thyroid gland). Lymphomas are discussed in our separate document, *Non-Hodgkin Lymphoma*.

Thyroid sarcoma: These rare cancers start in the supporting cells of the thyroid. They are often aggressive and hard to treat. Sarcomas are discussed in our separate document, *Sarcoma: Adult Soft Tissue Cancer*.

Parathyroid cancer

Behind, but attached to, the thyroid gland are 4 tiny glands called the *parathyroids*. The parathyroid glands help regulate the body's calcium levels. Cancers of the parathyroid glands are very rare — there are probably fewer than 100 cases each year in the United States.

Parathyroid cancers are often found because they cause high blood calcium levels. This makes a person tired, weak, and drowsy. It can also makes you urinate (pee) a lot, causing dehydration, which can make the weakness and drowsiness worse. Other symptoms include bone pain and fractures, pain from kidney stones, depression, and constipation.

Larger parathyroid cancers may also be found as a nodule near the thyroid. No matter how large the nodule is, the only treatment is to remove it surgically. Unfortunately, parathyroid cancer is much harder to cure than thyroid cancer.

The remainder of this document only discusses thyroid cancer.

What are the key statistics about thyroid cancer?

The American Cancer Society's estimates for thyroid cancer in the United States for 2015 are:

- About 62,450 new cases of thyroid cancer (47,230 in women, and 15,220 in men)
- About 1,950 deaths from thyroid cancer (1,080 women and 870 men)

Thyroid cancer is commonly diagnosed at a younger age than most other adult cancers. Nearly 2 out of 3 cases are found in people younger than 55 years of age. About 2% of thyroid cancers occur in children and teens.

The chance of being diagnosed with thyroid cancer has risen in recent years and it the most rapidly increasing cancer in the US. Most of this is the result of the increased use of thyroid ultrasound, which can detect small thyroid nodules that might not otherwise have been found in the past. Still, at least part of the increase is from finding more large tumors as well.

The death rate from thyroid cancer has been fairly stable for many years, and remains very low compared with most other cancers. Statistics on survival rates for thyroid cancer are discussed in the section "Thyroid cancer survival by type and stage."

What are the risk factors for thyroid cancer?

A risk factor is anything that affects a person's chance of getting a disease such as cancer. Different cancers have different risk factors. Some risk factors, like smoking, can be changed. Others, like a person's age or family history, can't be changed.

But risk factors don't tell us everything. Having a risk factor, or even several risk factors, does not mean that you will get the disease. And many people who get the disease may have few or no known risk factors. Even if a person with thyroid cancer has a risk factor, it is very hard to know how much that risk factor may have contributed to the cancer.

Scientists have found a few risk factors that make a person more likely to develop thyroid cancer.

Gender and age

For unclear reasons thyroid cancers (like almost all diseases of the thyroid) occur about 3 times more often in women than in men.

Thyroid cancer can occur at any age, but the risk peaks earlier for women (who are most often in their 40s or 50s when diagnosed) than for men (who are usually in their 60s or 70s).

A diet low in iodine

Follicular thyroid cancers are more common in areas of the world where people's diets are low in iodine. In the United States, most people get enough iodine in their diet because it is added to table salt and other foods. A diet low in iodine may also increase the risk of papillary cancer if the person also is exposed to radioactivity.

Radiation

Exposure to radiation is a proven risk factor for thyroid cancer. Sources of such radiation include certain medical treatments and radiation fallout from power plant accidents or nuclear weapons.

Having had head or neck radiation treatments in childhood is a risk factor for thyroid cancer. Risk depends on how much radiation is given and the age of the child. In general, the risk increases with larger doses and with younger age at treatment. Before the 1960s, children were sometimes treated with low doses of radiation for things we wouldn't use radiation for now, like acne, fungus infections of the scalp (ringworm), or enlarged tonsils or adenoids. Years later, the people who had these treatments were found to have a higher risk of thyroid cancer. Radiation therapy in childhood for some cancers such as lymphoma, Wilms tumor, and neuroblastoma also increases risk. Thyroid cancers that develop after radiation therapy are not more serious than other thyroid cancers.

Imaging tests such as x-rays and CT scans also expose children to radiation, but at much lower doses, so it's not clear how much they might raise the risk of thyroid cancer (or other cancers). If there is an increased risk it is likely to be small, but to be safe, children should not have these tests unless they are absolutely needed. When they are needed, they should be done using the lowest dose of radiation that still provides a clear picture.

Several studies have pointed to an increased risk of thyroid cancer in children because of radioactive fallout from nuclear weapons or power plant accidents. For instance, thyroid cancer was many times more common than normal in children who lived near Chernobyl, the site of a 1986 nuclear plant accident that exposed millions of people to radioactivity. Adults involved with the cleanup after the accident and those who lived near the plant have also had higher rates of thyroid cancer. Children who had more iodine in their diet appeared to have a lower risk.

Some radioactive fallout occurred over certain regions of the United States after nuclear weapons were tested in western states during the 1950s. This exposure was much, much lower than that around Chernobyl. A higher risk of thyroid cancer has not been proven at these low exposure levels. If you are concerned about possible exposure to radioactive fallout, discuss this with your doctor.

Being exposed to radiation when you are an adult carries much less risk of thyroid cancer.

Hereditary conditions and family history

Several inherited conditions have been linked to different types of thyroid cancer, as has family history. Still, most people who develop thyroid cancer do not have an inherited condition or a family history of the disease.

Medullary thyroid cancer

About 1 out of 3 medullary thyroid carcinomas (MTCs) result from inheriting an abnormal gene. These cases are known as *familial medullary thyroid carcinoma* (FMTC). FMTC can occur alone, or it can be seen along with other tumors.

The combination of FMTC and tumors of other endocrine glands is called *multiple endocrine neoplasia type 2* (MEN 2). There are 2 subtypes, MEN 2a and MEN 2b, both of which are caused by mutations (defects) in a gene called *RET*.

- In MEN 2a, MTC occurs along with pheochromocytomas (tumors that make adrenaline) and with parathyroid gland tumors.
- In MEN 2b, MTC is associated with pheochromocytomas and with benign growths of nerve tissue on the tongue and elsewhere called *neuromas*. This subtype is much less common than MEN 2a.

In these inherited forms of MTC, the cancers often develop during childhood or early adulthood and can spread early. MTC is most aggressive in the MEN 2b syndrome. If MEN 2a, MEN 2b, or isolated FMTC runs in your family, you may be at very high risk of developing MTC. Ask your doctor about having regular blood tests or ultrasound exams to look for problems and the possibility of genetic testing.

Other thyroid cancers

People with certain inherited medical conditions have a higher risk of more common forms of thyroid cancer. Higher rates of thyroid cancer occur among people with uncommon genetic conditions such as:

Familial adenomatous polyposis (FAP): People with this syndrome develop many colon polyps and have a very high risk of colon cancer. They also have an increased risk of some other cancers, including papillary thyroid cancer. *Gardner syndrome* is a subtype of FAP in which patients also get certain benign tumors. Both Gardner syndrome and FAP are caused by defects in the gene *APC*.

Cowden disease: People with this syndrome have an increased risk of thyroid problems and certain benign growths (including some called hamartomas). They also have an increased risk of cancers of the thyroid, uterus, breast, as well as some others. The thyroid cancers tend to be either the papillary or follicular type. This syndrome is most often caused by defects in the gene *PTEN*. It is also known as Multiple Hamartoma Syndrome and PTEN Hamartoma Tumor Syndrome

Carney complex, type I: People with this syndrome may develop a number of benign tumors and hormone problems. They also have an increased risk of papillary and follicular thyroid cancers. This syndrome is caused by defects in the gene *PRKAR1A*.

Familial nonmedullary thyroid carcinoma: Thyroid cancer occurs more often in some families, and is often seen at an earlier age. The papillary type of thyroid cancer most often runs in families. Genes on chromosome 19 and chromosome 1 are suspected of causing these familial cancers.

If you suspect you might have a familial condition, talk with your doctor, who might recommend genetic counseling if your medical history warrants it.

Family history: Having a first-degree relative (parent, brother, sister, or child) with thyroid cancer, even without a known inherited syndrome in the family, increases your risk of thyroid cancer. The genetic basis for these cancers is not totally clear.

Do we know what causes thyroid cancer?

Thyroid cancer is linked with a number of inherited conditions (described in the section “What are the risk factors for thyroid cancer?”), but the exact cause of most thyroid cancers is not yet known.

Certain changes in a person’s DNA can cause thyroid cells to become cancerous. DNA is the chemical in each of our cells that makes up our *genes* – the instructions for how our cells function. We usually look like our parents because they are the source of our DNA. But DNA affects more than just how we look. It also can influence our risk for developing certain diseases, including some kinds of cancer.

Some genes contain instructions for controlling when our cells grow and divide into new cells. Certain genes that help cells grow and divide or make them live longer than they should are called *oncogenes*. Other genes that slow down cell division or make cells die at the right time are called *tumor suppressor genes*. Cancers can be caused by DNA changes that turn on oncogenes or turn off tumor suppressor genes.

People inherit 2 copies of each gene – one from each parent. We can inherit damaged DNA from one or both parents. Most cancers, though, are not caused by inherited gene changes. In these cases, the genes change during a person’s life. They may occur when a cell’s DNA is damaged by something in the environment, like radiation, or they may just be random events that sometimes happen inside a cell, without an outside cause.

Papillary thyroid cancer

Several DNA mutations (changes) have been found in papillary thyroid cancer. Many of these cancers have changes in specific parts of the *RET* gene. The altered form of this gene, known as the *PTC* oncogene, is found in about 10% to 30% of papillary thyroid cancers overall, and in a larger percentage of these cancers in children and/or linked with radiation exposure. These *RET* mutations usually are acquired during a person's lifetime rather than being inherited. They are found only in cancer cells and are not passed on to the patient's children.

Many papillary thyroid cancers have a mutated *BRAF* gene. The *BRAF* mutation is less common in thyroid cancers in children and in those thought to develop from exposure to radiation. Cancers with *BRAF* changes tend to grow and spread to other parts of the body more quickly.

Both *BRAF* and *RET/PTC* changes are thought to make cells grow and divide. It is extremely rare for papillary cancers to have changes in both the *BRAF* and *RET/PTC* genes. Some doctors now advise testing thyroid biopsy samples for these gene mutations, as they can help diagnose cancer and may also affect the patient's outlook (see "How is thyroid cancer diagnosed?").

Changes in other genes have also been tied to papillary thyroid cancer, including those in the *NTRK1* gene and the *MET* gene.

Follicular thyroid cancer

Acquired changes in the *RAS* oncogene have a role in causing some follicular thyroid cancers.

Anaplastic thyroid cancer

These cancers tend to have some of the mutations described above and often have changes in the *TP53* tumor suppressor gene and the *CTNNB1* oncogene as well.

Medullary thyroid cancer

People who have medullary thyroid carcinoma (MTC) have mutations in different parts of the *RET* gene compared with papillary carcinoma patients. Nearly all patients with the inherited form of MTC and about 1 of every 10 with the sporadic (non-inherited) form of MTC have a mutation in the *RET* gene. Most patients with sporadic MTC have gene mutations only in their cancer cells. Those with familial MTC and MEN 2 inherit the *RET* mutation from a parent. These mutations are in every cell of the patient's body and can be detected by testing the DNA of blood cells.

In people with inherited mutations of *RET*, one *RET* gene is usually normal and one is mutated. Because every person has 2 *RET* genes but passes only one of them to a child (the child's other *RET* gene comes from the other parent), the odds that a person with familial MTC will pass a mutated gene on to a child are 1 in 2 (or 50%).

Can thyroid cancer be prevented?

Most people with thyroid cancer have no known risk factors, so it is not possible to prevent most cases of this disease.

Radiation exposure, especially in childhood, is a known risk factor for thyroid cancer. Because of this, doctors no longer use radiation to treat less serious diseases. Imaging tests such as x-rays and CT scans also expose children to radiation, but at much lower doses, so it's not clear how much they might raise the risk of thyroid cancer (or other cancers). If there is an increased risk it is likely to be small, but to be safe, children should not have these tests unless they are absolutely needed. When they are needed, they should be done using the lowest dose of radiation that still provides a clear picture.

Blood tests can be done to look for the gene mutations found in familial medullary thyroid cancer (MTC). Because of this, most of the familial cases of MTC can be prevented or treated early by removing the thyroid gland. Once the disease is discovered in a family, the rest of the family members can be tested for the mutated gene.

If you have a family history of MTC, it is important that you see a doctor who is familiar with the latest advances in genetic counseling and genetic testing for this disease. Removing the thyroid gland in children who carry the abnormal gene will probably prevent a cancer that might otherwise be fatal.

Can thyroid cancer be found early?

Many cases of thyroid cancer can be found early. In fact, most thyroid cancers are now found much earlier than in the past and can be treated successfully.

Most early thyroid cancers are found when patients see their doctors because of neck lumps or nodules they noticed. If you have unusual symptoms such as a lump or swelling in your neck, you should see your doctor right away.

Other cancers are found by health care professionals during a routine checkup. The American Cancer Society recommends that doctors do a cancer-related checkup that includes an examination of the thyroid during routine physical exams. Some doctors also recommend that people examine their own necks twice a year to look and feel for any growths or lumps.

Early thyroid cancers are also sometimes found when people have ultrasound tests for other health problems, such as narrowing of carotid arteries (which pass through the neck to supply blood to the brain) or for enlarged or overactive parathyroid glands.

EXHIBIT 11

ing rebuilt. A new wave of land concessions have been granted to multinational corporations seeking to extract Liberia's mineral and agricultural wealth. Yet investment in the country's medical infrastructure languishes. Liberia has fewer than 200 doctors for a population of 4 million. It is poorly equipped to deal with the current public health crisis. Remembering this history can help us understand why the current Ebola epidemic — and the ecology of fear associated with it — is unfolding as it is.

My dinner hosts on the Liberia–Guinea border knew of Ebola and its risks long before the disease made Western headlines. They were not ignorant. Their fears, like my own, were grounded in past experiences and present circumstances.

But we shared more than fear. We also shared a common history, one that has bound the United States and Liberia since free blacks from America first settled on West African shores in the 1820s.

And the laughter we shared that day, when a fearful white American asked the question, "Bush meat?" spoke to a recognition not of difference but of a shared humanity.

In this moment of crisis, fears arising from difference and ignorance of the historical and cultural contexts that underlie mistrust create a toxic ecology in which the Ebola virus thrives and spreads.

As of mid-September, total international pledges for Ebola aid amount to approximately $338 million.[3] Personnel from the U.S. Centers for Disease Control and Prevention are now on the ground in Liberia. But international aid workers will need to engage many people in local communities to win this fight against Ebola. Unless aid workers and the media understand local fears, we may fail to stem the crisis, which is devastating the economy, health, and well-being of a nation with deep historical ties to the United States.

Modern medicine owes a debt to West Africans for past sacrifices made in the advancement of global health. This week's announcement by President Barack Obama of a U.S. commitment to build 17 Ebola treatment centers in Liberia, train medical workers, provide testing kits, and offer logistic support is a welcome and needed response. It should be the start of a long-term, concerted effort to strengthen the public health infrastructure, which is critical to the region's future stability.

Disclosure forms provided by the author are available with the full text of this article at NEJM.org.

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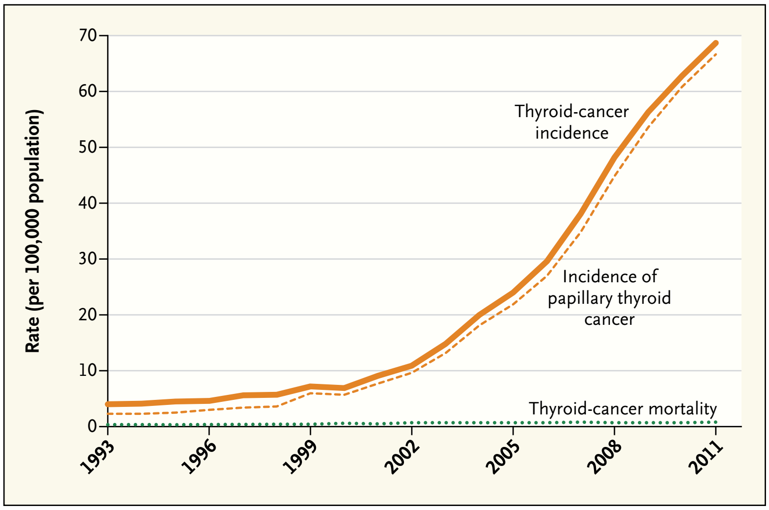
Korea's Thyroid-Cancer "Epidemic" — Screening and Overdiagnosis

Hyeong Sik Ahn, M.D., Ph.D., Hyun Jung Kim, M.P.H., Ph.D., and H. Gilbert Welch, M.D., M.P.H.

The Republic of Korea has provided national health insurance to its 50 million citizens since the 1980s. Although health care expenditures in South Korea's single-payer system are relatively low — accounting for 7.6% of the country's gross domestic product — the system is technologically intensive; among the countries in the Organization for Economic Cooperation and Development, it ranks second in acute care beds per million population, fifth in computed tomography (CT) scanners per million population, and fourth in magnetic resonance imaging (MRI) machines per million population. The country also has a well-developed data infrastructure for both vital statistics (Statistics Korea) and cancer incidence (Korean Central Cancer Registry).

In 1999, the government initiated a national screening program for cancer and other common diseases. This program now provides screening for breast, cervical, colon, gastric, and hepatic



Thyroid-Cancer Incidence and Related Mortality in South Korea, 1993–2011.

Data on incidence are from the Cancer Incidence Database, Korean Central Cancer Registry; data on mortality are from the Cause of Death Database, Statistics Korea. All data are age-adjusted to the South Korean standard population.

cancers free of charge or, for people with above-average income, for a small copayment. Although thyroid-cancer screening was not included in the program, providers frequently chose to offer screening with ultrasonography as an inexpensive add-on for $30 to $50. Many hospitals now market "health checkup" programs that include thyroid-cancer screening with ultrasonography, in addition to more technologically intensive exams (such as MRI and positron-emission tomography–CT), and many general practitioners have ultrasonography machines in their offices and commonly scan the thyroid. Both the government and the media have frequently extolled the virtues of early cancer detection.

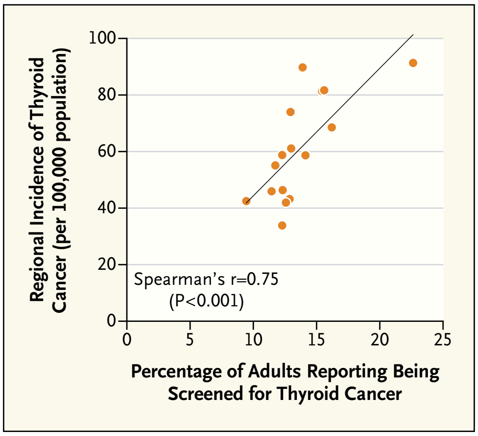
Earlier this year, a few physicians presented a different perspective, expressing concern about overdiagnosis of thyroid cancer and suggesting that screening be banned. Major newspapers picked up the story, running headlines asking "Is thyroid cancer overdiagnosed?"[1] There was also widespread broadcast coverage, including special programs devoted to the issue on all three of the country's major television networks. Yet because it is so challenging to adequately explain why early diagnosis and treatment of a common type of cancer could be problematic, thyroid-cancer screening continues to grow in popularity.

Vital statistics and cancer-registry data for South Korea illustrate the effect of screening. Thyroid-cancer incidence increased slowly during the 1990s, then rapidly after the turn of the century (see line graph). In 2011, the rate of thyroid-cancer diagnoses was 15 times that observed in 1993. This entire increase can be attributed to the detection of papillary thyroid cancer. Furthermore, despite the dramatic increase in incidence, mortality from thyroid cancer remains stable — a combination that is pathognomonic for overdiagnosis.

Variation in thyroid-cancer incidence across the country's 16 administrative regions may be explained by screening penetration (see scatter plot). In 2010, the Korean Community Health Survey (the government's annual nationwide health survey) asked adults older than 19 years of age whether they had been screened for thyroid cancer during the previous 2 years. There was a strong correlation between the proportion of the population screened in a region in 2008 and 2009 and the regional incidence of thyroid cancer in 2009. Although the aggregate correlation could be vulnerable to the ecologic fallacy, the finding of significant positive correlations in each of eight age- and sex-based groups suggests that the finding is more robust.

Thyroid cancer is now the most common type of cancer diagnosed in South Korea. More than 40,000 people in the country were diagnosed with the disease in 2011 — a figure that is more than 100 times the number of people who die from thyroid cancer, which for the past decade has been between 300 and 400 each year. Virtually all the people diagnosed with thyroid cancer are treated: roughly two thirds undergo radical thyroidectomy, and one third undergo subtotal thyroidectomy. The tumors being excised are getting smaller — at one center, the proportion of patients undergoing surgery for a tumor measuring less than 1 cm in diameter increased from 14% in 1995 to 56% 10 years later.[2] Despite guidelines recommending against evaluation and surgery for tumors less than 0.5 cm in diameter, one quarter of surgical patients now have tumors that fall into this category.

Thyroid-cancer surgery has substantial consequences for patients. Most must receive lifelong



Penetration of Thyroid-Cancer Screening (2008–2009) and Incidence of Thyroid Cancer (2009) in the 16 Administrative Regions of South Korea.

Data on thyroid-cancer screening are from the Korean Community Health Survey Database, Korea Centers for Disease Control and Prevention; data on incidence are from the Cancer Incidence Database, Korean Central Cancer Registry.

thyroid-replacement therapy, and a few have complications from the procedure. An analysis of insurance claims for more than 15,000 Koreans who underwent surgery showed that 11% had hypoparathyroidism and 2% had vocal-cord paralysis.[3]

Pathologists have long recognized the existence of a substantial reservoir of subclinical thyroid cancer. In 1947, a report in the *Journal* pointed out the discrepancy between the frequent finding of thyroid cancer at autopsy and its rarity as a cause of death.[4] It has been estimated that at least one third of adults harbor small papillary thyroid cancers, the vast majority of which will not produce symptoms during a person's lifetime.[5] As the South Korean data show, all it takes to expose this reservoir is ultrasonographic screening.

The experience with thyroid-cancer screening in South Korea should serve as a cautionary tale for the rest of the world. During the past two decades, multiple countries have had a substantial increase in thyroid-cancer incidence without a concomitant increase in mortality. According to the Cancer Incidence in Five Continents database maintained by the International Agency for Research on Cancer, the rate of thyroid-cancer detection has more than doubled in France, Italy, Croatia, the Czech Republic, Israel, China, Australia, Canada, and the United States. The South Korean experience suggests that these countries are seeing just the tip of the thyroid-cancer iceberg — and that if they want to prevent their own "epidemic," they will need to discourage early thyroid-cancer detection.

Disclosure forms provided by the authors are available with the full text of this article at NEJM.org.

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National Health Spending in 2014 — Acceleration Delayed

Charles Roehrig, Ph.D.

On the basis of data from the Bureau of Economic Analysis (BEA), it was widely reported in May that U.S. health care spending during the first 3 months of 2014 grew at an annualized rate of about 10% relative to the previous quarter. It appeared, at that point, that the 5-year run of sub-4% growth that began in 2009 was ending with a double-digit bang. However, 2 months later, revised BEA data showed a dramatic change: first-quarter health spending had actually fallen at a 0.9% annual rate.

The pronounced difference between these two estimates is highly influenced by the method used to compute growth rates. Spending in the first quarter of 2014 was compared with spending in the fourth quarter of 2013, and the percent change was compounded to convert it to an annual rate. An alternative approach is to compare first-quarter spending in 2014 with first-quarter spending in 2013. Such a calculation encompasses a full year of change and generally has a superior signal-to-noise ratio.[1] Applying this method to the BEA data brings the estimates much closer together — 6.3% initially, revised to 3.5% — but the two are still different enough to beg for explanation.

Health economists have anticipated a jump in health spending

EXHIBIT 12

DEPARTMENT OF ECOLOGY
State of Washington

Washington State Department of Health

PCB Chemical Action Plan

February 2015
Publication no. 15-07-002

3. Assess schools and other public buildings for the presence of PCB-containing building materials.

Goal: Reduce children's exposure to PCB-containing building materials in schools.
Goal: Prevent PCBs in building materials from getting into stormwater.

Many historical building materials, such as caulk and paint, have been found to contain high levels of PCBs. These materials are more common in industrial buildings, including schools, compared to residential buildings. It makes sense to focus on schools for testing and remediating these materials, as children are more sensitive to PCBs and the buildings are usually publically owned. Washington has not tested schools for PCBs, but other states have found high levels of PCB contamination in schools.

The first step in Recommendation #1 is to get information on how many of our approximately 9,000 school buildings are of the age and construction type likely to have PCB-containing materials. The information would be used to prioritize schools for testing, pending the availability of funding to either contain or remediate PCBs that pose a risk for children and teachers. A similar approach should be used to assess other public buildings once the assessment and remediation of schools is complete.

Ecology would initially focus on determining how many schools are likely to contain PCBs in historic building materials, narrow that list with visual inspections and then physical testing to determine the scope of the problem in Washington. This will determine how much time and money will be required for remediation and allow for long term planning, including funding. As Ecology learns more about PCB-containing building materials in Washington schools and other buildings, that information will be used to improve efforts to locate and remediate buildings. Environmental justice will also be considered in setting priorities for removing PCB-containing building materials.

Current Manufacturing Processes

4. Learn more about what products contain PCBs and promote the use of processes that don't inadvertently generate PCBs.

Goal: Reduce newly generated PCBs in manufacturing processes.

In 1982, the Environmental Protection Agency (EPA) identified 70 manufacturing processes likely to inadvertently generate PCBs. Little is known about most of this potentially large source of uncontained PCBs, including which congeners are produced. More information is known about PCBs in pigments and dyes, which are known to be released into the environment in stormwater, effluents from municipal treatment works, and effluents from pulp mills re-pulping post-consumer paper. Unpermitted non-point releases, such as from consumer products, are becoming increasingly important to control to reduce overall PCB delivery. Ecology should

Continued use and disposal of existing PCBs is governed by a framework of controls driven by the form the PCBs take (liquid form, non-liquid form, or multi-phasic, meaning a combination of liquid and non-liquid forms), the amount of PCBs in each form, and the original source of PCBs for media contaminated by a release.

While not a complete summary of all sections in TSCA that pertain to PCBs: below are some important requirements:

- Prohibits of manufacture, sale, and distribution, with exceptions.
- Mandates proper disposal for any PCBs unauthorized for use.
- Does not require testing to find PCB sources, but does require proper use and disposal of identified PCB contaminated items.
  - Many unauthorized uses are therefore not found until a release to the environment has occurred.
- Limits use of PCBs to certain “totally enclosed” uses, such as transformers and capacitors, or concentrations below 50 ppm in bulk product. Various other levels exist for remediation waste and other limited uses, typically with EPA approval.
- Requires that by December 1998, all known transformers containing PCBs >500 ppm be registered with EPA.
  - There is no requirement to determine if transformers contain >500 ppm PCBs, only to register it if it is known to be a PCB Transformer (>500 ppm PCBs).
- Allows many forms of PCB waste to be disposed of as municipal solid waste, which does not require PCBs to be listed on a manifest. Examples include:
  - Small non-leaking PCB capacitors.
  - Plastics (such as plastic insulation from wire or cable; radio, television and computer casings; vehicle parts; or furniture laminates); preformed or molded rubber parts and components; applied dried paints, varnishes, waxes or other similar coatings or sealants; caulking; Galbestos; non-liquid building demolition debris; or non-liquid PCB bulk product waste from the shredding of automobiles or household appliances from which PCB small capacitors have been removed (shredder fluff).
    - Any of these may also be disposed as landfill daily cover or as roadbed under asphalt.
  - Other PCB bulk product waste that leaches PCBs at <10 μg/L of water measured using a procedure used to simulate leachate generation.
  - PCB bulk product waste other than those materials listed above if:
    - The PCB bulk product waste is segregated from organic liquids disposed of in the landfill unit.
    - Leachate is collected from the landfill unit and monitored for PCBs.
- Requires labels identifying electrical equipment containing over 500 ppm PCBs.
- Requires quarterly inspections of PCB transformers containing more than 60,000 ppm PCBs. Transformers with less than 60,000 ppm PCBs and those with appropriate secondary containment must be inspected for leaks at least annually.

The first step toward preventing PCBs in building materials from getting into the environment is to compile, compose, and distribute information concerning best management practices for containment of PCB-containing materials. Based on available data in Washington, other government programs, and scientific literature, Ecology would develop BMPs for containing PCBs to prevent exposure during the life of the building and during remodeling or demolition. Ecology should also provide education and outreach on BMPs to local governments and those in the building trades.

Ecology estimates that developing BMPs would require an additional FTE of an Environmental Specialist 3 (ES3) for a three-year period. We employed Washington State employee pay grades at step H (DOP, 2014) and standard overhead cost assumptions used for legislative fiscal notes and related estimation (Ecology, 2013). One FTE at ES3 would cost $90,931 annually. Wages include the following adjustments for overhead expenses (per FTE):

- Benefits of 33.0 percent of salary
- Goods and services of $5,709 annually, or $2.74 per hour
- Travel costs of $1,394 annually, or $0.67 per hour
- Equipment costs of $1,131 annually, or $0.54 per hour
- Agency administrative overhead of 32.25 percent of salaries and benefits (Agency administrative overhead FTEs are included at 0.15 FTE per direct FTE, and are identified as Fiscal Analyst 2 and IT Specialist 2.)

While working on the BMPs, Ecology would also work to compile existing information into a PCB Source Control Guidance Manual to aid Local Source Control work. A number of urban waters programs around the northwest have performed PCB source identification work. However, to date, the lessons learned from each of these programs have not been synthesized and summarized for the benefit of future pollution prevention efforts at the state and local levels.

Ecology estimates that work on the best management practices and source control manual would last approximately three years (FY2016-FY2018) and result in total staff costs of $272,793.

3. Assess schools and other public buildings for the presence of PCB-containing building materials.

Goal: Reduce children's exposure to PCB-containing building materials.
Goal: Prevent PCBs in building materials from getting into stormwater.

Many buildings constructed prior to the ban of PCBs include materials, such as caulk, paint, and light ballasts that often contain high levels of PCBs. Industrial buildings, including schools, are more likely to contain PCB-contaminated materials than residential buildings. Other states have found high levels of PCB contamination in schools. Because children are more sensitive to PCBs and school buildings are typically publicly owned, Ecology recommends assessing public schools for possible PCB contamination first and expanding the effort to include other buildings, as appropriate.

To our knowledge, school districts in Washington have not systematically tested schools for PCBs. Schools built prior to 1980 are more likely to contain material with PCBs. The first step in assessing public school buildings that contain PCB material is to construct a centralized database based on information provided by school districts. The database would contain information on the date of construction and dates of renovation for each school building in Washington. The database would serve as a mechanism to identify schools, based on construction date, that require testing for PCBs. Initial testing would include visual inspections and then physical testing where appropriate. Ecology would use the database and test results to determine the scope of the problem in Washington and plan accordingly. A similar approach would be used to assess other public buildings once the assessment of schools is complete, and as resources allow.

Ecology estimates that the person retained to compile information on PCB light ballasts in schools would compile the database for building materials, as well. Ecology anticipates that two Environmental Specialist 3 (ES3) positions in other recommendations will merge tasks in FY2018:

- The 0.75 FTE at Environmental Specialist 3 (ES3) level at $68,198 annually would spend two years (FY2016-FY2017) focusing on light ballasts (Recommendation 1).
- The 0.25 FTE at the ES3 level at $22,733 annually would spend two years (FY2016-2017) focusing on electrical equipment (Recommendation 5).
- These positions would shift their database efforts to include other building materials at schools.

Ecology anticipates that work on this recommendation could span four years (FY2018- FY2021) for a total estimated cost of $363,724.

We employed Washington State employee pay grades at step H (DOP, 2014) and standard overhead cost assumptions used for legislative fiscal notes and related estimation (Ecology, 2013). Wages include the following adjustments for overhead expenses (per FTE):

- Benefits of 33.0 percent of salary
- Goods and services of $5,709 annually, or $2.74 per hour
- Travel costs of $1,394 annually, or $0.67 per hour
- Equipment costs of $1,131 annually, or $0.54 per hour
- Agency administrative overhead of 32.25 percent of salaries and benefits (Agency administrative overhead FTEs are included at 0.15 FTE per direct FTE, and are identified as Fiscal Analyst 2 and IT Specialist 2.)

Ecology understands the time and budget constraints facing school districts across the state. However, this recommendation would not require school districts to generate new reports or information. We assume that school districts have information concerning construction and renovation of school buildings from routine recordkeeping, operations, and maintenance documents. Therefore, we do not expect a cost to school districts to submit documents to Ecology for the database beyond minimal expenditures of time and resources to submit records to Ecology.

After compiling the database and conducting initial testing, Ecology would work with school districts to plan and coordinate remediation efforts at schools that have PCB-contaminated materials. There is no one size fits all approach to remediation projects for buildings containing PCBs (Environmental Health & Engineering, 2012). Depending on the extent of contamination, schools decide whether to pursue abatement (reducing the amount of PCBs in building materials permanently) or mitigation (controlling exposure) procedures. Regardless of the remediation technique, schools would need to work with local health agencies, Ecology, and EPA to meet removal criteria and follow hazardous waste regulations.

Estimating the cost of remediating school buildings in Washington is not possible without knowing the scope (number of schools and extent of remediation needed) of the problem. The number of school buildings and extent of work necessary to bring a building in compliance would determine bids from contractors and others involved in remediation activities. In addition, remediation activities generally involve mandated testing procedures, extensive planning, feasibility studies, and permitting requests. School districts might also have to explore temporarily relocating students during the initial testing/cleanup stage (depending on age of building and likelihood of PCB contamination). Because of the extensive nature of remediation projects, we feel that a database is appropriate to enable Ecology and school districts to narrow the scope, identify economies of scale, and prioritize remediation projects.

As mentioned above, systemic attributes of public entities make some estimates less reliable. We consider the process school districts use to price construction projects such a structural constraint. Generally, available data suggests that the cost of remediating PCB-contaminated school buildings depends on the extent of contamination and approach used by schools (abatement or mitigation) to address the problem. To our knowledge, no state has addressed PCB contamination in schools in a comprehensive manner. It appears that most schools learn of PCB contamination by miscellaneous tests conducted prior to unrelated renovation work, and must react quickly to bring exposure levels below EPA guidelines. This creates immediate financial stress on local/state agencies responsible for public health, school facilities, etc. Further, school districts face unique budget constraints and absorb costs differently than owners of private buildings.

Schools generally face administrative procedures (feasibility studies, budget requests, and limited window for large remediation projects) that increase the overall cost of projects. However, it is difficult to compare how school districts determine costs for certain projects, especially when comparing school districts in different regions or states. School districts in Washington form cost estimates based on the needs of schools here in Washington. In sum, existing estimates of remediation projects based solely on PCB contamination are too limited to provide a meaningful basis for comparison, at this point.

Acknowledging the above limitations, though, illustrates the need for Ecology to identify the scope of the problem here in Washington. We found estimates for remediation work at five schools in New York and two schools in Massachusetts. Estimates from remediation projects at the five public schools in New York City ranged from $3.2 million to $3.6 million (2014$) per school depending on the techniques (abatement or mitigation) used to address the PCB-contaminated areas (TRC, 2011). In 2010, an elementary school in Lexington, MA found PCB-contaminated material. The school had to close for a week while workers performed testing required by the EPA and performed preliminary cleanup work. Feasibility studies suggested that officials faced temporary solutions ranging from $3.0 million to $4.6 million (2014$) to relocate students while remediating the school (Goddard, 2010). Ultimately, officials decided to replace the school with a new $40 million building (Parker, 2014). A different school in Westport, MA also found PCB material and encountered initial costs in excess of $3 million (Wagner, 2014). Currently, the school faces additional costs ranging from $1.8 million to $7.75 million (2014$) (CGKV Architects, 2013) to remediate the PCB-contaminated material. Again, we consider the estimates from New York and Massachusetts more suggestive than representative. That said, the expenses incurred by the school districts in New York City and Massachusetts, along with the extent of activity required to remediate the structures, indicate a need to determine the scope of the problem by compiling construction dates and preliminary testing of high risk schools here in Washington.

Current Manufacturing Processes

4. Learn more about what products contain PCBs and promote the use of processes that don't inadvertently generate PCBs.

Goal: Reduce newly generated PCBs in manufacturing processes.

Unpermitted non-point releases, such as from consumer products, are becoming increasingly important to control in order to reduce total PCB delivery. In 1982, EPA identified 70 manufacturing processes that are likely to inadvertently generate PCBs, but little else is known about this potentially large source of uncontrolled PCBs. More information is known about PCBs in pigments and dyes, which are a known source of PCBs in the environment and a problem for

EXHIBIT 13

Exhibit 13: ENVIRON Review of Malibu Unites Analytical Laboratory Data

ENVIRON reviewed eleven laboratory reports containing analytical data for samples collected by Malibu Unites. The laboratory reports reviewed were:

- Frontier Analytical Laboratory (Frontier) report 8489 for caulk, dirt/soil, and wipe samples collected on May 10, 2014;
- Frontier report 8490 for caulk, dirt/soil, and wipe samples collected on May 10, 2014;
- A partial BC Laboratories, Inc. (BC Labs) report 1413266 for solid samples collected on May 10, 2014;
- BC Labs report 1413266 for solid samples collected on May 10 and 12, 2014;
- Eurofins Calscience (Eurofins) report 14-08-1493 for caulk samples collected on August 15, 2014;
- Eurofins report 14-09-2329 for a solid sample collected on September 23, 2014;
- Eurofins report 14-09-2338 for a solid sample collected on September 23, 2014;
- Eurofins report 14-11-2194 for a solid sample collected on November 20, 2014;
- Eurofins report 14-11-2196 for a solid sample collected on November 20, 2014;
- Eurofins report 14-11-2197 for a solid sample collected on November 20, 2014; and
- Eurofins report 14-11-2199 for a solid sample collected on November 20, 2014.

The samples were analyzed for polychlorinated biphenyls (PCBs) by United States Environmental Protection Agency (USEPA) Methods 8082A (gas chromatography) or USEPA Method 1668C (high-resolution gas chromatography/high resolution mass spectrometry), and for organochlorine pesticides by USEPA Method 8081B (gas chromatography).

ENVIRON's review was based on the Aroclor and pesticide data review procedures in the USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review dated June 2008. The information reviewed by ENVIRON included case narratives, chain-of-custody (COC) forms, sample preservation, holding times, sample dilutions, reporting limits, matrix spike/matrix spike duplicate (MS/MSD) analyses, laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses, surrogate recoveries, and blanks, where available. QC data from initial calibration, continuing calibration, method detection limit studies, etc., as well as raw data (e.g., run logs, chromatograms, quantitation reports) were not included in the laboratory reports and therefore were not reviewed by ENVIRON.

ENVIRON made the following observations based on its review:

General Observations

- All of the nine COCs are incomplete (one partial report did not contain a COC; see section on BC Labs below, and one was subcontracted to another laboratory). Nine of nine COCs are missing the sample matrix description and the sampler is not identified. Six of nine COCs are missing sampler signatures, and two of nine COCs show no analyses were requested. Two samples were also submitted to the laboratory without the date or time of collection recorded on the COC. This calls into question the integrity and conditions of all of the 39 samples and therefore the quality and usability of analytical data associated with those samples.

- Sample collection and preservation information prior to arrival at the laboratories is not documented on the COCs. There are time gaps from sample collection to receipt at the laboratory ranging from 3 days to one month, with the most common occurrence being 7-8 days. This calls into question the integrity and conditions of all of the 39 samples and therefore the quality and usability of the analytical data associated with those samples.
- Per USEPA guidance, solid samples have a holding time of 14 days prior to extraction and 40 days from extraction to analysis, and the samples should be maintained at 4 ± 2°C. For 12 samples, this holding time and sample preservation procedure was not observed.
- For 10 samples, the laboratories noted that due to high levels of analytes in samples, the samples required dilution. The laboratories noted that the surrogate recovery values were affected by sample matrix interference. This calls into question the accuracy and usability of the analytical data reported for the affected samples.

Specific Observations

Frontier Reports

- The COC forms are incomplete: the sampler is not identified, there is no signature by the sampler, the time when the sampler relinquished the samples to the custody of the laboratory was not noted, the sample matrix was not noted, and no method or analyses was requested. Additionally, for samples Ceiling Bulk-TT and Paint-TT, the date and time of sample collection were not noted.
- There is no explanation for where and how the samples were stored between collection on May 10, 2014 and receipt at the laboratory on May 13, 2014. This calls into question the integrity and conditions of the samples and therefore the quality and usability of the analytical data associated with those samples.
- For both reports, the laboratory did not provide MS/MSD or LCS/LCSD data. Data was included for a method blank and surrogates in each sample. MS/MSD and LCS/LCSD data is used to assess accuracy and precision of the analysis and without such data, the quality and usability of the data cannot be assessed.
- For both reports, the laboratory noted that due to high levels of analytes in Samples 8489-013-SA (JJC1) and 8490-006-SA (WW2), the samples required dilutions. The laboratory noted that the surrogate recovery was affected by sample matrix interference. This calls into question the accuracy and usability of analytical data associated with the above samples.

BC Labs Reports

- Based on the page numbers, it appears that BC Labs initially issued a 19-page report for report 1413266 on July 7, 2014; however, only selected pages of this report were available for review. A partial data validation report prepared by Neptune and Company, Inc. was included with the laboratory report. The Neptune report recommended that the laboratory provide the missing information needed for QC (calibration, calibration checks, run log, matrix spike source and internal standard information) and to explain the 1-month gap between data collection and relinquishment so that a complete evaluation could be performed. A second report 1413266, dated June 19, 2014, was provided that contains QC information and consists of 30 pages. ENVIRON reviewed that report and presents its observations in the following bullets.

- For the Method 8081B analysis for organochlorine pesticides, the laboratory noted that Samples 8489-011-SA-BB5, 8489-012-SA-KK1, and 8490-009-SA AJ1 were received past the holding time for this analysis. According to USEPA Publication SW-846, samples should be extracted within 14 days. These samples were collected on May 10 and 12, 2014 and were not received at BC Labs until June 13, 2014, more than one month after collection. Because the holding time for these samples were grossly exceeded, the quality and usability of the data for these samples is questionable.
- The samples analyzed by BC Labs were collected on May 10, 2014 and received by Frontier on May 13, 2014. Frontier subcontracted BC Labs to perform Methods 8082A for PCBs and 8081B analyses for organochlorine pesticides. On June 12-13, 2014, the samples were transferred from Frontier to BC Labs and received at BC Labs at 7.5°C. The prescribed holding time of 14 days and the sample preservation temperature of 4 ± 2°C were both exceeded, calling into question the quality and usability of the sample data.
- For the Method 8082A analysis for PCBs, the laboratory noted that due to high levels of analytes in Samples 8489-002-SA-LL2, 8489-013-SA-JJC1, and 8490-006-SA-WW2, the samples required dilutions. The laboratory noted that the surrogate recovery was not reportable due to this dilution. This calls into question the accuracy and usability of the analytical data for the above three samples.
- According to the COC accompanying the transfer of Sample 8490-009-SA AJ1 from Frontier to BC Labs, the sample was collected on May 12, 2014. However, according to the COC, when Sample 8490-009-SA AJ1 arrived at Frontier, this sample was collected on May 10, 2014. This calls into question the accuracy and reliability of the analytical data for this sample.

Eurofins Reports

- The COC forms for all samples submitted to Eurofins are incomplete. The sampler is not identified, and there is no time noted on the COC as to when the sampler relinquished the samples to the custody of the laboratory. In many cases, the sample matrix is not noted. Samples were sent via Fed Ex or delivered via a courier service and the sample custody conditions during transport were not noted. This calls into question the integrity and conditions of all of the samples involved and therefore the quality and usability of analytical data associated with those samples.
- There is no explanation on where and how the following samples were stored between collection and receipt at the laboratory. The samples were also received significantly above the prescribed preservation temperature of 4 ± 2°C. The affected samples are listed below:
  - For laboratory report 14-08-1493, samples were collected on May 15, 2014 and received at the laboratory on May 20, 2014 at 24.5°C.
  - For laboratory report 14-09-2329, samples were collected on September 23, 2014 and received at the laboratory on September 30, 2014 at 22.6°C.
  - For laboratory report 14-09-2338, samples were collected on September 23, 2014 and received at the laboratory on September 30, 2014 at 22.6°C.
  - For laboratory report 14-11-2194, samples were collected on November 20, 2014 and received at the laboratory on November 28, 2014 at 21.7°C.
  - For laboratory report 14-11-2196, samples were collected on November 20, 2014 and received at the laboratory on November 28, 2014 at 21.7°C.

  - For laboratory report 14-11-2197, samples were collected on November 20, 2014 and received at the laboratory on November 28, 2014 at 21.7°C.
  - For laboratory report 14-11-2199, samples were collected on November 20, 2014 and received at the laboratory on November 28, 2014 at 21.7°C.

  This calls into question the integrity and conditions of the samples contained in the above reports and therefore the quality and usability of analytical data associated with those samples.

- The laboratory noted that due to high levels of analytes in Samples 401-MHS, 505-MHS, JC18, JC22, and JC23, the samples required dilutions. The laboratory noted that surrogate compound recovery was out of the control limits because of this dilution and/or matrix interference. This calls into question the accuracy and usability of the analytical data for the above five samples.
- For the August 15, 2014 sampling date, the laboratory noted that the percent recovery for Aroclor 1260 was below the lower acceptable laboratory limit of 50%, at 25% (for MS) and 45% (for MSD). The accuracy of the reported Aroclor 1260 data for Samples AIR DUCT GUY, 401-MHS, and 505-MHS is questionable.

EXHIBIT 14

PCB Inspection and Sampling Report for Malibu High School and Juan Cabrillo Elementary School
for the Santa Monica-Malibu Unified School District

Prepared for:
Santa Monica-Malibu Unified School District
Santa Monica, California

Prepared by:
ENVIRON International Corporation
Irvine, California

Date:
December 2014

Project Number:
0433980F

ENVIRON

Executive Summary

ENVIRON International Corporation (ENVIRON) was retained by the Santa Monica-Malibu Unified School District (SMMUSD, or "the District") to conduct building inspection and sampling activities related to polychlorinated biphenyls (PCBs) at Malibu High School (MHS) and Juan Cabrillo Elementary School (JCES) in Malibu, California. The inspections and sampling were conducted from June through August 2014, while the District's custodians performed annual cleaning as part of its PCB Best Management Practices (BMPs). Inspections were conducted before (pre-) the BMP cleaning to inventory potential PCB-impacted sources in the buildings. Inspections were also conducted after (post-) the BMP cleaning to confirm that the rooms passed visual inspection criteria before sampling. Sampling was conducted pre- and post-BMP cleaning in both schools in part to evaluate the effectiveness of the BMP cleaning processes as well as to evaluate potential indoor exposures to PCBs.

Inspection and sampling activities were conducted in all nine pre-1981 buildings at MHS and all six pre-1981 buildings at JCES (Figures 1-1 and 1-2). To evaluate potential exposures to PCBs and the effectiveness of BMPs, the District voluntarily collected 163 air and 504 surface wipe samples (excluding ambient and blank samples). The air and surface wipe sampling PCB results were compared to health based screening levels established by the United States Environmental Protection Agency (USEPA) Region IX, before and after the implementation of BMPs and demonstrated that detected concentrations of PCBs were below levels considered protective of human health.

- Only one pre-BMP and none of the post-BMP air samples were above USEPA Region IX's health based screening levels for PCBs in air (200 nanograms per cubic meter (ng/m^3) for regularly[1] occupied classrooms with children more than 6 years old or 100 ng/m^3 for regularly occupied classrooms with children aged 3 to less than 6 years old).[2]
- Of the 504 surface wipe samples, 482 had PCB concentrations below the USEPA benchmark of 1 microgram per 100 square centimeters (µg/100 cm^2) and 85 percent (%) of the samples were non-detect. After BMPs, only two rooms contained sample locations that had PCB concentrations exceeding the screening level for surface wipes: MHS Building G (500, Angel Shark) Room 506 (woodshop) and JCES Building C Room 6 (office).
  - In Room 506 (woodshop), 8 wipe samples in that room did not have total PCB concentrations above the screening level. However, surface wipe samples taken on caulking around interior door frames in Room 506 (woodshop) had results greater than 10 µg/100cm^2 even after repairs and additional cleaning; therefore the District voluntarily included this room in their caulk removal plan approved by USEPA (USEPA, 2014g).

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1 Defined for this investigation as rooms typically occupied by an individual on a daily basis, excluding weekends, for at least 4 hours per day

2 The one result above USEPA's benchmark was in a room where orchestra risers (building materials) were removed just prior to the start of ENVIRON's June through August 2014 investigation even though District Facility's staff had requested that the school and parents not remove these building materials until after the planned summer investigation. It is likely that this activity impacted the results seen in this room as the riser removal resulted in damage to surrounding building materials. Thus, this finding is not typical of conditions in any other rooms at MHS or JCES.

  - The other room, JCES Room 6, had one location after implementation of BMPs with a PCB concentration slightly above the screening level of 1 µg/100 cm^2 (at 2.6 µg/100 cm^2), while 9 other final post-BMP surface wipe locations taken throughout the same room were non-detect for PCBs. When evaluating PCB exposures to dust concentrations in a room, USEPA clarified that it considers all the data in the room to estimate an exposure concentration and concluded that the results for this room are considered acceptable for occupancy (USEPA, 2014g).

- Several buildings had pre-BMP cleaning air and surface wipe sample results in all sampled rooms that were below USEPA's benchmarks. This indicates exposures were acceptable in these buildings even before implementation of annual BMP cleaning. This finding includes all of the buildings at JCES, as well as Building D (100 and 200, Mako Shark), Building E (000, Blue Shark), Building H (Auditorium/Cafeteria), and Building I (400, Leopard Shark) at MHS.
- The sampling results also demonstrated that BMP cleaning is an effective technique for generally reducing detected levels or maintaining non-detected levels of PCBs on indoor surfaces, without adversely impacting indoor air. Thus BMPs can be used to manage PCBs in place until the next scheduled building demolition/renovation or removal action. The results also indicate that a cleaning frequency of one annual BMP cleaning is more than sufficient to generally reduce detected or maintain non-detected PCB levels on indoor surfaces and in the indoor air.

USEPA research studies indicate that health concerns from PCBs in building materials primarily derive from inhalation of contaminated air, with secondary health concerns due to contact with PCBs in dust and subsequent incidental ingestion (USEPA, 2012a). According to USEPA: "Overall, the sampling data from the two schools demonstrate that these PCB exposure pathways are currently being addressed by the District's BMPs in a manner that protects public health. Thus, the District's undertaking of the BMPs, as verified by pre- and post-BMP sampling data, demonstrates that the TSCA [Toxic Substances Control Act] standard for no unreasonable risk is currently being met at MHS and JCES" (USEPA, 2014g).

Based on continuous implementation of the BMP program in conjunction with the District's planned removal of PCB-containing caulk per its USEPA-approved plan (USEPA, 2014g), USEPA has determined that conditions at the schools will continue to protect public health and meet the "no unreasonable risk" TSCA standard until building components are removed during school renovation or demolition. The ongoing efficacy of the BMPs and other approved measures will be verified through periodic evaluations as required by USEPA.

4 Summary of Inspection and Sampling Findings

This section includes a summary of inspection and sampling findings based on ENVIRON's work conducted at MHS and JCES during June through August 2014. At the beginning of the summer, most pre-1981 buildings at MHS and JCES—with the exception of Building G (500, Angel Shark) and Building D (100, Mako Shark) in which summer school took place—were closed and inspections, pre-BMP sampling, annual BMP cleaning implementation, and post-BMP sampling were conducted June through August. Based on the inspection and testing results, all buildings were re-opened prior to the first day of school on August 19, 2014.[7] Below is a summary of key inspection findings and sampling results. Building-specific information is provided in the tables, photologs, and figures in Appendices C through Q.

4.1 Summary of Inspection Findings

As discussed in the General Plan (ENVIRON, 2014a) and reported in the literature (USEPA, 2012a), potential primary sources of PCBs include a variety of materials, such as caulking (including sealant and glazing), lighting ballasts, dielectric fluid in capacitors and transformers, adhesives/mastic, ceiling tiles, electric wiring, paint, and surface coating (e.g., sprayed-on fireproofing material). Potential secondary sources of PCBs, which can absorb PCBs due to their proximity to potential primary PCB sources, include building materials such as insulation, backer rods, gaskets, cove base, polyurethane foam (e.g., furniture), wood, brick/mortar/cinder block, asphalt, stone (e.g., granite, limestone, marble, etc.), and concrete (USEPA, 2012a).

During June through August 2014, ENVIRON inspected all rooms—a total of 353 rooms, including stairwells and closets—in the pre-1981 buildings at MHS and JCES. The most frequently encountered potential primary PCB-impacted building materials included paint, caulking (including sealant and glazing), and adhesives/mastic. Surface coating (e.g., sprayed-on fireproofing material) is a potential primary PCB-impacted building material that was not observed. The most frequently encountered potential secondary PCB-impacted building materials included concrete, wood, and cove bases. Backer rods is a potential secondary PCB-impacted building material that was not observed. A higher percentage of rooms in MHS were observed to contain potential primary PCB-impacted building materials such as caulking (including sealant and glazing), lighting ballasts, dielectric fluid in transformers, adhesives/mastic, and ceiling tiles than rooms in JCES. Any magnetic ballasts located in JCES were labeled as "no PCBs", whereas approximately 4 percent of all rooms in MHS contained magnetic ballasts not specified to be PCB free (10 of 266 rooms). Detailed inventories on the types, locations, and conditions of potential primary and secondary PCB-impacted building materials are provided in Tables 1 and 2 of Appendices C through Q.

- As discussed in Section 2, one of the objectives of the inspection was to assess the condition of potential PCB-impacted materials. While many of the potential PCB-impacted materials appeared to be in good or fair condition, some of the materials exhibited signs of damage or deterioration. For example, approximately 42% of the rooms in pre-1981

[7] All rooms in all pre-1981 buildings were open to students and faculty, except for Room 506 (woodshop) in Building G (500, Angel Shark) at MHS and Room 6 (office) in Building C at JCES. In addition, as further discussed in the building-specific memorandums contained in Appendices C through Q, the District custodian staff is completing BMP-cleaning in some low occupancy rooms, which are on a different annual schedule.

buildings inspected at MHS and JCES showed evidence of damage or deterioration of caulk (including glazing or sealant). Similarly, approximately 55% of the rooms in pre-1981 buildings inspected at MHS and JCES showed evidence of damaged (e.g., cracked, chipped, or peeling) paint. The District will be addressing these areas as part of their maintenance program for potential PCB-impacted materials under the General Plan (Appendix A).

4.2 Overview of Sampling – Evaluation of Potential for Exposures to PCBs

As described in USEPA Region IX's approval letter (USEPA, 2014g), USEPA research studies have shown that the main health concerns due to the presence of PCBs in building materials are primarily related to the inhalation of PCBs in air and secondarily from skin contact with PCBs in dusts and incidental ingestion of these dusts (USEPA, 2012a). Thus, the sampling conducted by ENVIRON from June through August 2014 focused on the collection of both air and surface wipe sampling to evaluate the presence of PCBs in both the air and in surface dusts. Detailed sample results are provided in Tables 4 through 7 in Appendices C through Q.

Based on the air and surface wipe sample results described in the following sections, potential exposures to PCBs were found to be acceptable (i.e., below relevant USEPA benchmarks) at MHS and JCES and the District has re-opened all rooms in all pre-1981 buildings except for the woodshop (Room 506 in Building G (500, Angel Shark)) at MHS. USEPA confirmed that the data collected pre- and post-BMP cleaning demonstrate that "…PCB exposure pathways are currently being addressed by the District's BMPs in a manner that protects public health" and that the data "…demonstrate that the TSCA standard for no unreasonable risk is currently being met at MHS and JCES" (USEPA, 2014g).

4.2.1 Air Sample Results

As indicated in Table 4-1 and shown in Figures 4-1 and 4-3, airborne levels of PCBs in all sampled rooms (62 total pre-cleaning samples and 101 total post-cleaning samples, excluding ambient and field blanks) were either not detected or less than USEPA's recommended health benchmark of 200 ng/m^3 or 100 ng/m^3 benchmark for regularly occupied classrooms with children aged 3 to less than 6 years old, except one pre-cleaning sample in Room 303 in Building F (300, Thresher Shark).[8] The post BMP-cleaning air sample in this room was non-detect for PCBs. Therefore, the data demonstrate that potential airborne (inhalation) exposures to PCBs are all below USEPA's acceptable health benchmark that was developed to protect public health.

ENVIRON notes that some of the light fixtures (mostly in the ballast compartment of the fixture) inspected in Building A (800, Great White Shark), Building B/C (900, Whale Shark), Building D (100 & 200, Mako Shark), Building F (300, Thresher Shark), Building G (500, Angel Shark), and Building J (700, Old Gymnasium) exhibited visual evidence of past leakage. Some of these

[8] The one result above USEPA's benchmark is in a room where orchestra risers (building materials) were removed just prior to the start of ENVIRON's June through August 2014 investigation even though District Facility's staff had requested that the school and parents not remove these building materials until after the planned summer investigation. It is likely that this activity impacted the results seen in this room as the riser removal resulted in damage to surrounding building materials. Thus, this finding is not typical of conditions in any other rooms at MHS or JCES.

6 Conclusions

Based on the inspection and sampling results described in this report, ENVIRON concludes the following:

6.1 PCB Exposures are Acceptable and USEPA Concurs

Review and analysis of air sample results before and after BMP cleaning show that all but 1 pre-BMP air sample were either not detected or below USEPA's recommended health benchmark of 200 ng/m^3 (or 100 ng/m^3 benchmark for regularly occupied classrooms with children aged 3 to less than 6 years old). 100% of post-BMP air samples were below the age appropriate benchmark.[12]

Review and analysis of all pre-BMP surface wipe sample results indicate that nearly 95% of pre-BMP cleaning samples were non-detect or had total PCB concentrations below USEPA's recommended benchmark of 1 µg/100 cm^2. Furthermore, more than 97% of the initial (before any re-cleaning) post-BMP cleaning samples were non-detect or had total PCB concentrations below USEPA's benchmark and following additional BMP cleaning, all but five wipe samples in two rooms were below the USEPA benchmark.

According to USEPA: "Overall, the sampling data from the two schools demonstrate that these PCB exposure pathways are currently being addressed by the District's BMPs in a manner that protects public health. Thus, the District's undertaking of the BMPs, as verified by pre- and post-BMP sampling data, demonstrates that the TSCA [Toxic Substances Control Act] standard for no unreasonable risk is currently being met at MHS and JCES" (USEPA, 2014g).

All nine pre-1981 buildings at MHS—Building A (800, Great White Shark), Building B/C (Building 900, Whale Shark), Building D (100 & 200, Mako Shark), Building E (000, Blue Shark), Building F (300, Thresher Shark), Building G (500, Angel Shark), Building H (Cafeteria/Auditorium), Building I (400, Leopard Shark), and Building J (700, Old Gymnasium)—have been reopened by the District based on inspection and sampling results during June through August 2014 except for the MHS woodshop (Room 506 in Building G (500, Angel Shark)) which the District voluntarily included in their caulk removal plan approved by USEPA (USEPA, 2014g).

All six pre-1981 buildings at JCES—Building A, Building B, Building C, Building D, Building E, and Building F—have been reopened by the District based on investigation and sampling results during June through August 2014.

6.2 Efficacy and Frequency of BMP Cleanings

PCB concentrations in post-BMP surface wipe samples were generally lower than PCB concentrations in pre-BMP samples, thus demonstrating that BMP cleaning is an effective technique for generally reducing detected levels or maintaining non-detected levels of PCBs on

[12] The one result above USEPA's benchmark is in a room where built-in orchestra risers (building materials) were removed with damage to surrounding building materials just prior to the start of ENVIRON's June through August 2014 investigation even though District Facility's staff had requested that the school and parents not remove these building materials until after the planned investigation as the riser removal resulted in damage to surrounding building materials. It is likely that this activity impacted the results seen in this room. Thus, this finding is not typical of conditions in any other rooms at MHS or JCES.

indoor surfaces, without adversely impacting indoor air, as well as managing PCBs in place until the next scheduled building demolition/renovation.

While the appropriate frequency of BMP cleaning will continue to be assessed with additional sampling in the future, the results from the June through August 2014 sampling program indicate that a cleaning frequency of one annual BMP cleaning is more than sufficient to generally reduce detected or maintain non-detected PCB levels on indoor surfaces and in the indoor air.

6.3 Future Monitoring Plans

Based on the large percentage of rooms and buildings that had PCB air and surface dust concentrations that were non-detect or below the respective USEPA benchmark, it is recommended that only a subset of rooms be sampled during future sampling events.

As discussed in Section 4.5, to identify which rooms to sample during future events, ENVIRON segregated the rooms sampled during the June through August 2014 sampling program into three groups:

- Group 1: Rooms with verified building materials greater than 50 ppm PCBs regulated by USEPA, which includes the MHS Building A (800, Great White Shark) Rooms 800 and 801 (collectively referred to as Library) and Building E (000, Blue Shark) Rooms 1, 5, and 8;
- Group 2: Buildings where pre-BMP cleaning air and surface wipe sample results in all sampled rooms were below USEPA's benchmarks that indicated exposures were acceptable even before implementation of annual BMP cleaning; which includes all of the buildings at JCES, as well as Building D (100 and 200, Mako Shark), Building E (000, Blue Shark, which was part of the December 2013 cleaning activities) except Rooms 1, 5, and 8, Building H (Auditorium/Cafeteria), and Building I (400, Leopard Shark) at MHS; and
- Group 3: The remaining pre-1981 Buildings at MHS: Building A (800, Great White Shark) except Rooms 800 and 801, Building B/C (900, Whale Shark), Building F (300, Thresher Shark), Building G (500, Angel Shark), and Building J (700, Old Gymnasium).

A representative subset of randomly chosen regularly occupied rooms in each of these groups will be re-sampled (air and dusts on surfaces with high skin exposure potential [e.g., desks and tables].) during the upcoming 2014/2015 winter break. Within the limited time available during this winter break, ENVIRON will sample all the rooms in Group 1 (5 rooms), one room in each JCES building (6 rooms total) and 7 rooms at MHS (15% of regularly occupied rooms in MHS) in Group 2, and 25% of the regularly occupied rooms in Group 3 (12 rooms). This representative data set will be sufficient to confirm whether conditions have changed since the summer 2014 annual BMP cleaning given the results seen to date.

A similar approach, based on the collective results of the summer 2014 and winter 2014/2015 sampling programs will be used to select rooms for the June 2015 sampling.

EXHIBIT 15

2014/2015 Winter Break PCB Sampling Report for Malibu High School and Juan Cabrillo Elementary School

for the Santa Monica-Malibu Unified School District

Prepared for:
Santa Monica-Malibu Unified School District
Santa Monica, California

Prepared by:
ENVIRON International Corporation
Irvine, California

Date:
March 2015

Project Number:
0433980N

ENVIRON

Table 2-1. Number of Regularly Occupied Rooms Sampled Relative to Total Number of Rooms
Malibu High School and Juan Cabrillo Elementary School
Malibu, California

School	Building	Total Number of Rooms	Number of Classrooms	Number of Regularly Occupied Rooms	2014/2015 Winter Break Sampling			
					Number of Rooms Sampled	Number of Regularly Occupied Rooms Sampled	Percent of Rooms Sampled	Percent of Regularly Occupied Rooms Sampled
MHS	A (800, Great White Shark)	20	2	8	4	4	20%	50%
	B/C (900, Whale Shark)	30	0	16	4	4	13%	25%
	D (100, Mako Shark)	38	7	15	1	1	3%	7%
	D (200, Mako Shark)	29	13	13	2	2	7%	15%
	E (000, Blue Shark)	21	10	12	5	5	24%	42%
	F (300, Thresher Shark)	22	3	6	2	2	9%	33%
	G (500, Angel Shark)	26	5	9	2	2	8%	22%
	H (Cafeteria/Auditorium)	32	0	6	2	2	6%	33%
	I (400, Leopard Shark)	9	2	3	1	1	11%	33%
	J (700, Old Gymnasium)[1]	37	1	10	2	2	5%	20%
JCES	A	14	0	3	1	1	7%	33%
	B	20	4	5	1	1	5%	20%
	C	15	4	5	1	1	7%	20%
	D	13	4	4	1	1	8%	25%
	E	6	0	3	1	1	17%	33%
	F	19	7	8	2	2	11%	25%
Total	**MHS**	**264**	**43**	**98**	**25**	**25**	**9%**	**26%**
	JCES	**87**	**19**	**28**	**7**	**7**	**8%**	**25%**
	Overall	**351**	**62**	**126**	**32**	**32**	**9%**	**25%**

Notes:
1. Total number of rooms for Building J (700, Old Gymnasium) includes the two rooms that comprise the swimming pool and pool house.
2. The focus of the sampling efforts was in regularly occupied rooms as indicated in the shaded columns. The regularly occupied rooms sampled are expected to be representative of the other regularly occupied rooms not sampled.

Abbreviations:
JCES = Juan Cabrillo Elementary School
MHS = Malibu High School

EXHIBIT 16

March 19, 2015

Update to SMMUSD Board

Juan Cabrillo Elementary School (JCES)

Malibu High School (MHS)

PCB Remediation Options

Option A – Caulk	Option B – Caulk	Option C
(Temporary Solution)	(Permanent Solution)	(PCB-free Solution)
Remove caulk > 50 ppm PCBs	Remove caulk > 50 ppm PCBs	Abate all PCB impacted materials,
and	and	Demolish school buildings constructed pre-1981
Encapsulate adjacent contaminated substrate (brick, cement, wallboard, etc.)	Remove adjacent contaminated substrate material containing > 1 ppm PCBs	and
		Rebuild

Major Cost Drivers (Options A and B)

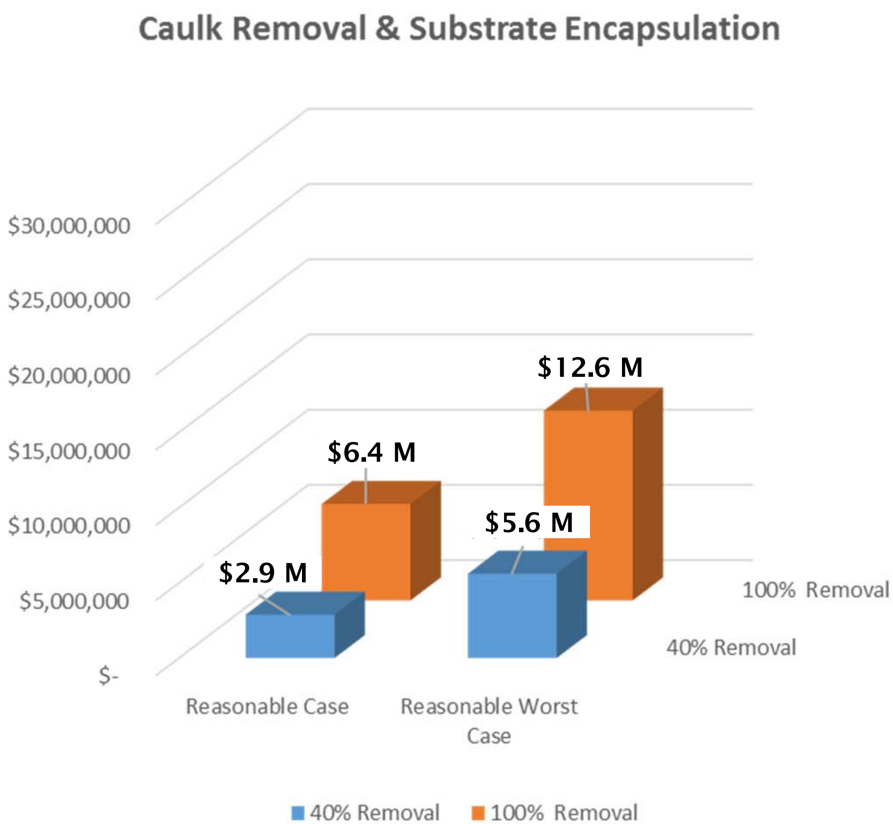
% of caulk > 50 ppm PCBs drives:

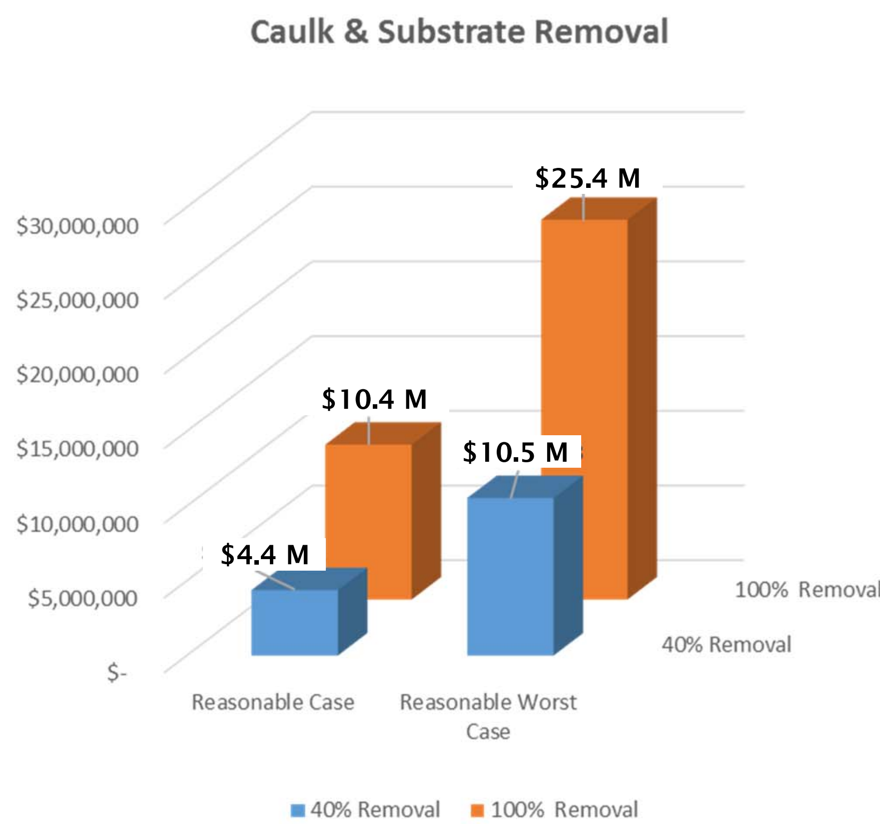
- Extent of remediation efforts
- Extent of consultant sampling efforts for characterization, oversight, and post-remediation confirmatory sampling
- Assumed 40% (reasonable case) and 100% (reasonable worst case)

Major Cost Driver (Option C)

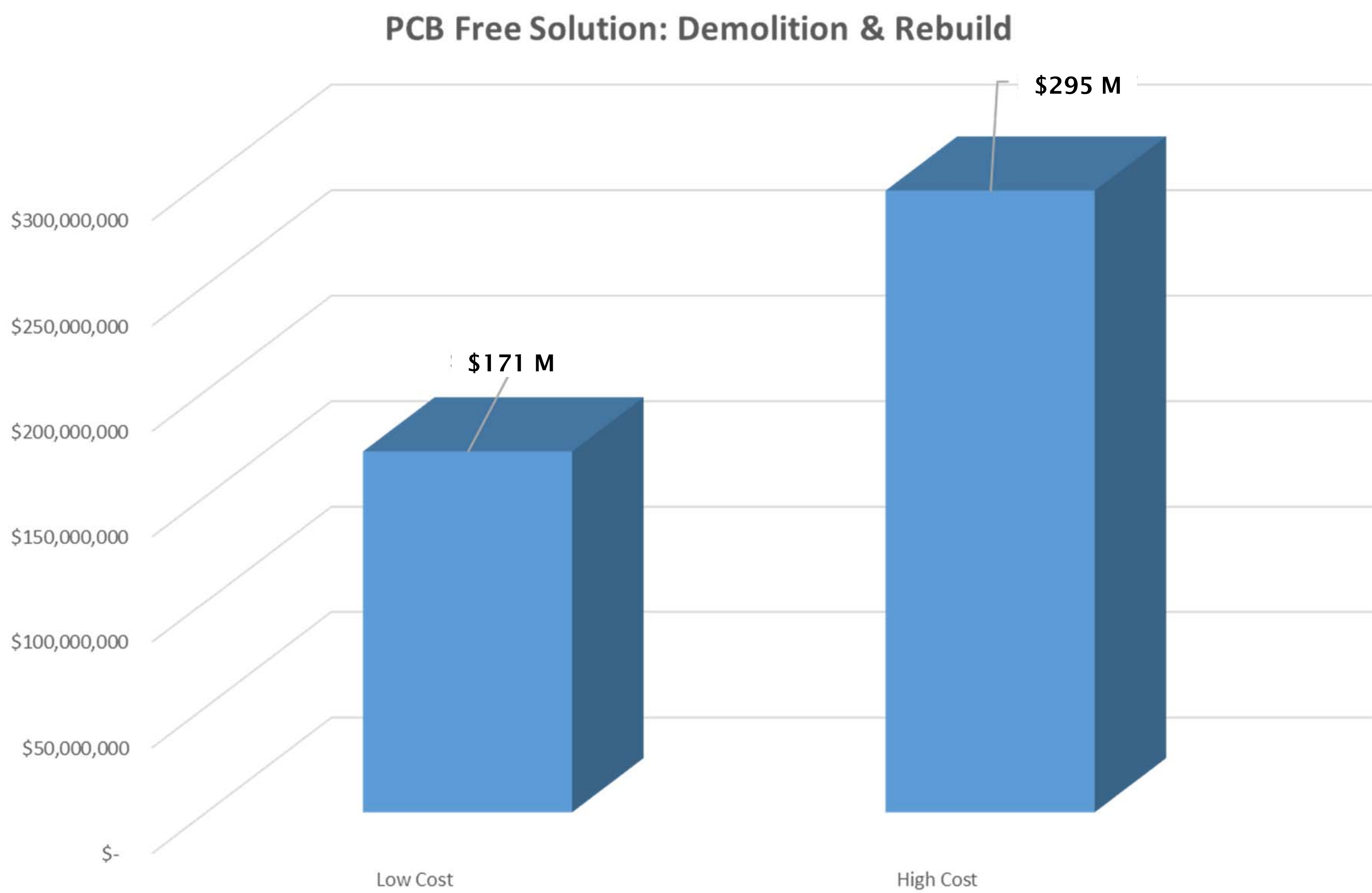
- Demolition and construction costs

PCB Remediation Cost Estimates MHS/JCES – Options A/B for Caulk





PCB Remediation Cost Estimates MHS/JCES – Option C for PCB-free Solution



Reference PCB Remediation Cost Estimates from other Schools[1]

- All had air concentrations above EPA Public Health Levels for Schools
- Five Public Schools/New York City (WDOE, 2015)
  - Feasibility study evaluated caulk remedial/mitigation options
  - $3.2M to $3.6M per school (abatement/mitigation)
- Elementary School/Lexington, MA (Goddard, 2010; Parker 2014)
  - Estimated $2.8 to $4.2 million to relocate students during remediation
  - Officials decided to replace the school at a cost of $33M to $40M
- Westport, MA School (CGKV Architects, 2013)
  - Costs of initial 2011 Source Removal Project = $3.2 million
  - Feasibility study recommended the following sustainable solution:
    - Mandatory removal of remaining PCB Source Material = $1.6M;
    - Limited removal & encapsulation of known PCB Remediation Waste = $4.4M; and
    - Remediation of unconfirmed PCB Remediation Waste = $1.75M - $2.1M (encapsulation versus removal)

[1] Washington Department of Ecology. 2015. PCB Chemical Action Plan. Publication No. 15-07-002. P. 161. February 2015.

EXHIBIT 17

Department of Public Facilities

Estabrook Space Options

Pat Goddard
October 26, 2010

Agenda

- **Estabrook Option A**
  (Add 26 modular classrooms behind Estabrook on recreation field)

- **Estabrook Option B**
  (Add 20 modular classrooms behind Estabrook by playground, but split into two sections)

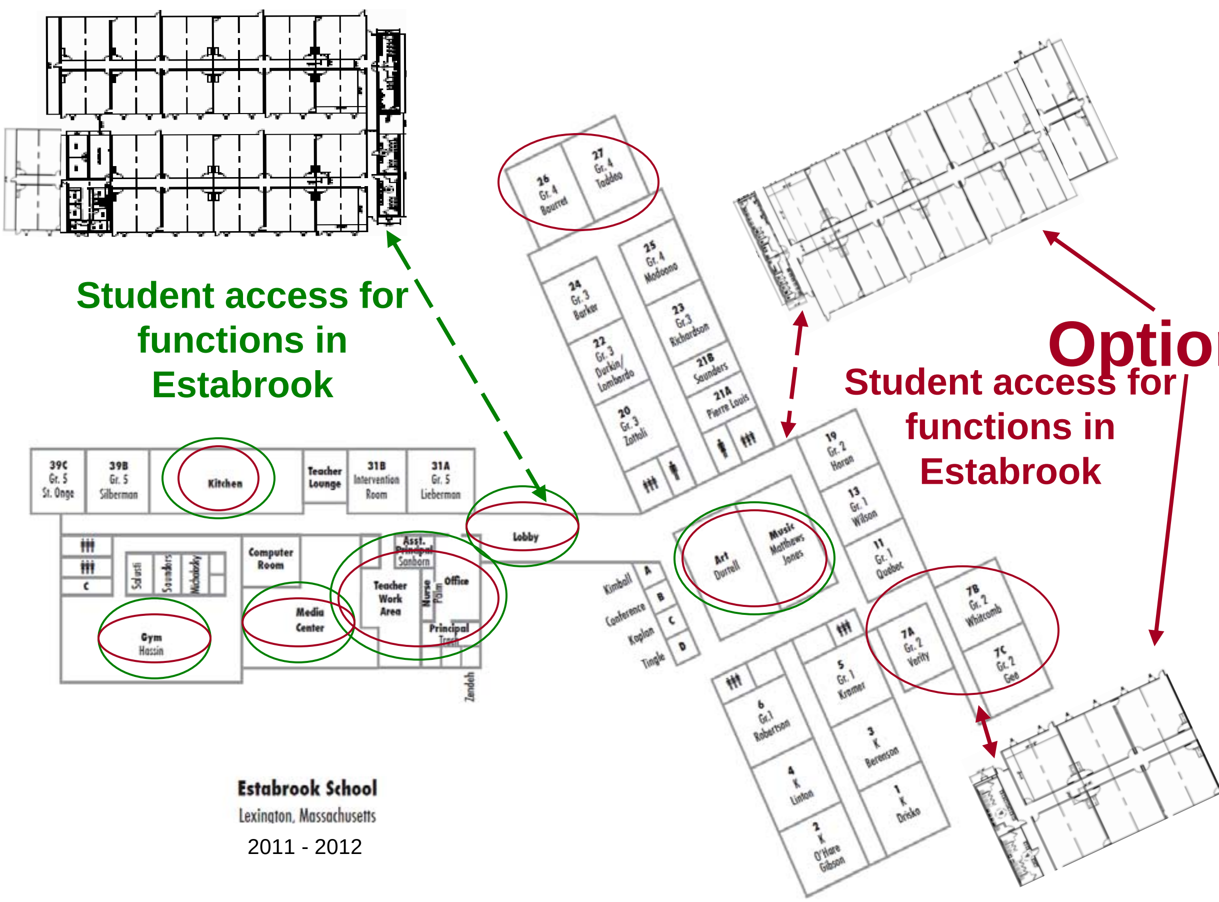
- **Old Harrington Option C**
  (Move Estabrook to Old Harrington, move Central Administration to Estabrook)

Estabrook Option (A)

Estabrook Option (B)

Schematic A & B

Option A



Estabrook Option (A)

Estabrook Location (A)	Budget	Schedule	Comments
Classrooms	$ 1,909,500		25,460 square feet with 22 classrooms, 4 rooms to be programmed (intervention, care, sub-seperate specialized spaces, administration) and restrooms.
Other Spaces			Assumes continued use of art, music, library, gym, kitchen and other educational spaces.
Installation	$ 1,222,080		Quote from Williams Scotsman (W-S)($75/sq ft new, $48/sq ft installation)
Process:			
Design	$ 140,921	6 weeks	Design documents and bid documents to be prepared for public bidding process as required by Chapter 149. Documents also required for review by Building Department, Fire Department and Conservation Commission.
Bid/Contract		6 weeks	Chapter 149 requirement
Construct/Install		16 weeks	Could be shortened by in stock modulars. Schedule supplied by W-S
		28 Weeks	If start on November 1, complete on May 14. *Assumes a source of construction funds can be identified and appropriated by Town Meeting before January 21, 2011*
	$ 3,272,501		
Utility:			
water/sewer	$ 25,000		Assumption of water & sewer within 50 feet is reasonable, extra cost for demobilization as standard is cut and cap.
electrical	$ 25,000		Capacity may be required for power for modulars rooms.
tel/data	$ 50,000		Quote assumes existing capacity available but currently there is not room for expansion on phone pbx. Similarly, data capacity will need to be reviewed and potentially added.
fire suppression	$ 30,000		Installation assumes sufficient water supply within 50 feet. Likely that 4" water line will require upgrade
storm water	$ 30,000		Run off from buildings will need to be mitigated
	$ 160,000		
	$ 343,250		Design and Construction Contingency (10%)
	$ 3,775,751		Estimated Authorization Request
Regulatory Reviews:			
Ma Division of Capital Asset Management (DCAM)			Reviews applications for Emergency Waivers
Building Department			Modular classrooms must be Certified by State of Massachusetts. Must comply with building code, plumbing code, assessibility code, etc.
Fire Department			Project Approval by Fire Prevention Officer is required.
Conservation Commission			Site borders wetlands, new roof area may be an issue, will require mitigation
Board of Health			Plan review
NOTE:	**$800,000**		**Current Woburn project, 7 classrooms for 24 months**

Estabrook Option (B)

Estabrook Location (B)	Budget	Schedule	Comments
Classrooms	$ 1,395,750		18,610 square feet with 17 classrooms, 3 rooms to be programmed (intervention, care, sub-seperate specialized spaces, administration) restrooms and administrative space.
Other Spaces			Continue to use 7a,7b,7c, 26, & 27. Assumes continued use of art, music, library, gym, kitchen and other educational spaces.
Installation	$ 893,280		Quote from Williams Scotsman (W-S)($75/sq ft new, $48/sq ft installation)
Process:			
Design	$ 103,006	6 weeks	Design documents and bid documents to be prepared for public bidding process as required by Chapter 149. Documents also required for review by Building Department, Fire Department and Conservation Commission.
Bid/Contract		6 weeks	Chapter 149 requirement
Construct/Install		16 weeks	Could be shortened by in stock modulars. Schedule supplied by W-S
		28 Weeks	If start on November 1, complete on May 14. ***Assumes a source of construction funds can be identified and appropriated by Town Meeting before January 21, 2011***
	$ 2,392,036		
Utility:			
water/sewer	$ 50,000		Assumption of water & sewer within 50 feet is reasonable, extra cost for demobilization of two sets of rooms.
electrical	$ 25,000		Capacity may be required for power for modulars rooms, but fewer rooms.
tel/data	$ 40,000		Quote assumes existing capacity available but currently there is not room for expansion on phone pbx. Similarly, data capacity will need to be reviewed and potentially added.
fire suppression	$ 30,000		Installation assumes sufficient water supply within 50 feet. Likely that 4" water line will require upgrade
storm water	$ 20,000		Not near wetlands
	$ 165,000		
	$ 255,704		Design and Construction Contingency (10%)
	$ 2,812,740		Estimated Authorization Request
Regulatory Reviews:			
Ma Division of Capital Asset Management (DCAM)			Reviews applications for Emergency Waivers
Building Department			Modular classrooms must be Certified by State of Massachusetts. Must comply with building code, plumbing code, assessibility code, etc.
Fire Department			Project Approval by Fire Prevention Officer is required.
Conservation Commission			New roof area may be an issue, will require mitigation
Board of Health			Plan review
NOTE:	$800,000		Current Woburn project, 7 classrooms fro 24 months

Estabrook Option (C)

Estabrook Option (C)

Estabrook Location (C)	Budget	Schedule	Comments
Classrooms	$ 852,390		20 Classroom spaces existing, but five rooms have been partitioned for offices and the library partitioned and converted to a conference room. The lunch room has been converted to the print shop. ***6.930 square feet with 6 modular classrooms and restrooms. Program among classrooms and music, art,care, intervention, and two sub-separate specialized spaces. ($75/sq ft mfg + $48/sq ft install)***
Other Spaces	$ 100,000		Relocation space for LABBB and pre-k, currently undefined. Assume upgrade existing modulars.
Construction Old Harrington	$ 1,922,856		Likely will trigger requirement for building to come into compliance with Eighth Edition of the Ma Building Code. Master Plan estimated HC access at $672,856. Sprinkler estimate $750,000. General renovation $500,000.
Construction Estabrook	$ 550,000		$550,000 spent to date for converting OH to office use
Process:			
Code Analysis	$ 10,000	2 weeks	Prepare Building Code Analysis for review with local officials to determine extent of renovations required for Old Harrington. Converting back to school use will constitute a change to Educational Use Group. A design Professional needs to develop a plan for educational occupancy of the old Harrington and determine how many trailers are needed to supplement.
Program Analysis	$ 10,000	Concurrent	
Design	$ 225,000	8 weeks	Design documents and bid documents to be prepared for public bidding process as required by Chapter 149. Documents also required for review by Building Department, Fire Department and Conservation Commission. Design included Estabrook modifications.
Bid/Contract		6 weeks	
Construct/Install		20 weeks	***No location for Administration during construction***
		36 Weeks	If start on November 1, complete on May 14. ***Assumes a source of funds can be identified and appropriated by Town Meeting before January 21, 2011***
	$ 3,670,246		
Utility: For modular			
water/sewer	$ 50,000		Dependent on modular requirement and code analysis
electrical	$ 25,000		Dependent on modular requirement and code analysis
tel/data	$ 40,000		Dependent on modular requirement and code analysis
Conservation Commission	$ 20,000		New roof area may be an issue, will require mitigation
	$ 135,000		
	$ 380,525		Design and Construction Contingency (10%)
	$ 4,185,771		Estimated Authorization Request
Regulatory Reviews:			
Ma Division of Capital Asset Management (DCAM)			Reviews applications for Emergency Waivers
Building Department			Converting back to school use will constitute a change in use.
Fire Department			Project Approval by Fire Prevention Officer is required.
Conservation Commission			Plan review
Board of Health			Plan review
NOTE:		Mar-09	Master Plan estimates renovation cost $4.8M to $7.9M

Summary

Estabrook Option	A	B	C
Budget			
Classrooms, Installed	$ 3,131,580	$ 2,289,030	$ 852,390
Other Spaces			$ 100,000
Construction Old Harrington			$ 1,922,856
Construction Estabrook			$ 550,000
Design	$ 140,921	$ 103,006	$ 245,000
Utility:			
water/sewer	$ 25,000	$ 50,000	$ 50,000
electrical	$ 25,000	$ 25,000	$ 25,000
tel/data	$ 50,000	$ 40,000	$ 40,000
fire suppression	$ 30,000	$ 30,000	0
storm water	$ 30,000	$ 20,000	$ 20,000
	$ 160,000	$ 165,000	$ 135,000
Contingency	$ 343,250	$ 255,704	$ 380,525
Total Cost	**$ 3,775,751**	**$ 2,812,740**	**$ 4,185,771**
Schedule			
Design	6 weeks	6 weeks	8 weeks
Bid/Contract	6 weeks	6 weeks	6 weeks
Construct/Install	16 weeks	16 weeks	20 weeks
	28 Weeks	28 Weeks	36 Weeks

Conclusions

- Estabrook Option B is the lowest cost option at approximately $2.8M and this option will require approximately 28 weeks to implement.

- A Design authorization of approximately $100,000 would be required to fully investigate this option and to prepare for a construction authorization of approximately $2.7M.

- Renovating the Old Harrington building would first require relocation of existing functions (LPS Administration, pre- K, and LABBB) before construction could begin. . Old Harrington is the smallest elementary school, and additional classrooms would still be required. The plan assumes the central office would be relocated to Estabrook. The prior search for private space did not yield available or suitable space.

EXHIBIT 18

LEXINGTON

Lexington Town Meeting approves new Estabrook school funding

Posted by Brock Parker

April 3, 2012 10:18 AM

By Brock Parker, Town Correspondent

Special Town Meeting gave its unanimous support Monday to a plan to replace the PCBs-plagued Estabrook Elementary School in Lexington.

The townâ€™s legislative body voted in favor of appropriating about $40 million to build a new Estabrook school next to the current school on Grove Street.

Students will remain in the old school until the new, three-story building is completed in time for the opening of school in September of 2014, said School Committee chairwoman Mary Ann Stewart.

The 51-year-old Estabrook School had to be closed for a week in the fall of 2010 when potentially harmful levels of chemicals known as PCBs were found in the building. Town and school officials made a number of temporary moves to bring the PCBs levels down and at the same time began expediting plans to replace the building.

In January, Lexington voters approved a debt exclusion override to pay for the new building, but Town Meeting still had to approve the funding. Stewart said the state could reimburse the town about $13 million for the new school. But the town must still enter into a funding agreement with the Massachusetts School Building Authority.

The Estabrook School houses about 460 students, but the new building will have space for about 540 students. It will also have a rooftop garden and planners are incorporating a high level of energy efficient and environmentally friendly features in the design.

EXHIBIT 19

LEXINGTON

Lexington Town Meeting approves more funding for Estabrook School, tax break for Vista Print

Posted by Brock Parker

November 20, 2012 09:35 AM

By Brock Parker, Town Correspondent

Lexington Town Meeting approved additional funding to build a new Estabrook Elementary School Monday and made its pitch to encourage Vistaprint, Inc. to stay in Lexington and expand.

Town Meeting members also approved $1.5 million in road, sidewalk and drainage improvements at Grove Street and Robinson Road around the new Estabrook School.

That amount was separate from $2.6 million in additional funding Town Meeting approved for the construction of the new Estabrook School. The rising cost of steel and construction costs have pushed the price tag over the $40 million estimate by the town in the spring.

The tax incentive finance agreement approved for Vistaprint would provide the company tax relief of more than $1.2 million over a 13-year period if it expands into a new building proposed on Hayden Avenue. The company is an online supplier of graphic design services and customized print products that is headquartered in Paris. But the company runs its United States operations out of Two Ledgemont Center at 95 Hayden Avenue.

Town Manager Carl Valente said that if Vistaprint is convinced to stay and expand in Lexington, it could hasten the development of a Three Ledgemont Center, which would be about 160,000 square feet.

The new building is expected to generate about $600,000 a year in property taxes, but Valente said that if Vistaprint does not seek to expand into the space it could take two additional years before the building is constructed.

If Vistaprint does expand into the new space, Valente said construction would begin in the first quarter of 2013 and be completed two years later.

The company is also looking at expanding in another community, and Michael Greiner, the chief accounting officer for Vistaprint, said the amount of tax relief is not enough for the company to commit to stay in Lexington. But Greiner said the tax relief does add a reason for the company to expand Lexington.

EXHIBIT 20

Polychlorinated Biphenyls (PCBS) Source Removal Project Report and Management Plan

Westport Middle School
400 Old Colony Road, Westport, Massachusetts

Westport Community Schools

17 Main Road, Westport, MA

April 1, 2013

FUSS & O'NEILL EnviroScience, LLC

Fuss & O'Neill EnviroScience, LLC
50 Redfield Street, Suite 100
Boston, MA 02122

Project No. 20080788.A6E

1 Executive Summary

Fuss & O'Neill EnviroScience, LLC (EnviroScience) was retained to provide inspection, testing, planning, and on-site project monitoring for work involving the removal of Polychlorinated Biphenyls (PCBs) in source building materials.

Westport Community Schools was selected as the recipient of funds from the Massachusetts School Building Authority (MSBA) for a Green Repairs Project at the Westport Middle School. The Green Repair Project was to include replacement of existing metal window systems and exterior door systems.

During the planning portion of the project, a due diligence inspection involving the testing of building materials for potential hazardous materials was conducted in May 2011. A summary report was prepared which identified building materials associated with the window systems and door systems to contain PCBs as source PCB Bulk Product Waste exceeding U.S. Environmental Protection Agency (EPA) concentrations of 50 ppm. In addition to PCBs the materials also contained asbestos.

The discovery of PCBs which exceed EPA maximum allowable of 50 ppm is considered a prohibited or an "unauthorized use" of PCBs according to the Toxic Substance Control Act (TSCA) and therefore subject to the requirements that the materials be immediately removed in accordance with EPA regulation 40 CFR 761.

The Green Repair project could not occur until the summer of 2012 due to required planning and length of time to manufacture and receive replacement window systems which would not allow for immediate response to replace the windows and doors and address the PCBs identified in the caulking and glazing compounds. Additional testing of adjacent substrates, soil, indoor air, and wipe sampling was performed in June 2011. Intent of adjacent porous surface sampling and soil sampling was to determine additional remediation work that would be required during replacement of window and door systems to be included in an overall project budget.

Indoor air sampling and wipe sampling was required due to the delay in performance of any work until 2012 and proposed occupancy of the school building in September 2011. Also, the structure of the building is concrete frame and removal of framework if contaminated by a source of PCBs would require potential use of encapsulation techniques under a Risk Based Disposal Plan in accordance with 40 CFR 761.61 (c).

Adjacent substrates including porous brick and adjacent concrete were sampled in June 2011. Adjacent materials were determined to contain PCBs within a range of 0.12 ppm to a high of 39 ppm up to 1 inch depth into substrate at caulking joints. A total of 21 samples of surface soil were collected along the building perimeter on all four sides of the structure and limited location determined to contain PCB concentrations above 1 ppm. A total of 20 wipe samples were collected adjacent to windows and doors on non-porous floor surfaces and porous window sill surfaces. Non-porous floor surfaces ranged from a low of 0.21 micrograms per wipe to a high of 110 micrograms per wipe. Porous brick window sills ranged from a low of none detected (ND) to a high of 2.5 micrograms per wipe.

Indoor air sampling was performed utilizing Method T0-1OA homolog analysis for PCBs. In total 14 locations were sampled. The results were compared to EPA Public Health Levels of PCBs in School

Indoor Air for school age children 6 <12 years of age which is 300 ng/m^3. The results identified 8 of the 14 samples exceeded this Public Health Level with a range of None Detected to a High of 990 ng/m^3 and average was 432 ng/m^3. School had been dismissed for the summer recess at the time sample results were received and teachers and custodial staff were removed from the building at that time and not permitted to occupy the building.

The information was transmitted to the EPA Region 1 coordinator via telephone call on June 24, 2011 after presented to the Westport Permanent School Committee meeting on June 23, 2011. EPA Region 1 coordinator recommended proceeding with attempts to identify additional PCB Bulk Product material inside the building due to elevated concentrations of PCBs in indoor air.

On June 27 and 29, 2011 limited additional potential sources of interior PCB Bulk Product Waste were sampled. Inspection involved a review of unit ventilator units at walls, ceiling and roofs for potential caulking, sealants or other suspect PCB items or materials. Identified suspect materials included locations of interior caulking at columns, a foam filler at concrete beams and columns, mastic/felt above " tectum" ceiling panels, white plaster material at air intake at unit ventilators, and homasote insulation at roof air intake ducts. Of the sampled materials regulated concentrations of PCBs above 50 ppm were identified associated with interior caulking at columns, the foam filler at concrete beams and columns, mastic/felt above " tectum" ceiling panels. The significant sources of PCB Bulk Product included more than 70,000 square feet of ceiling mastic and 6,000 LF of caulking both interior and exterior to the building.

The discovery of interior sources of PCBs prompted a site meeting with EPA Region 1 Coordinator to discuss next steps in planning process and potential occupancy of school in September 2011. The site meeting occurred on July 14, 2011. The significant sources of PCBs at Westport Middle School prompted several challenges to occupy the building in September 2011 and the Westport Community Schools Superintendent began identification of alternative space options which included split schedules at Westport schools, use of other School districts, abandoned buildings, and portable classrooms as alternatives to occupancy of the Westport Middle School.

A pilot project was planned and work was conducted by Triumvirate Environmental Inc. (Triumvirate). The pilot project included an action plan in several representative rooms of the building to physically remove materials to better understand the feasibility of conducting the work, associated time and cost to complete, and identify, with post removal air samples, the effectiveness of reducing indoor air quality to acceptable ranges.

Results of the pilot project determined the effectiveness of reducing indoor air concentrations by removing most of the identified interior sources of PCBs and limited removal of exterior caulking materials around windows beneath unit ventilator intake points. Indoor air sample results identified post removal indoor air concentrations to be close to or lower than 300 ng/m^3.

A special meeting of the Westport Permanent School Committee was held to identify the results of the pilot project and to discuss anticipated costs for replication of process throughout the school building on August 2, 2011. Budget costs were prepared by Triumvirate. A meeting was held with EPA Region 1 Coordinator to discuss the plans to move forward with source removal of identified PCB Bulk Product materials. EPA Region 1 Coordinator confirmed no formal submission of a plan was required. Caution was offered by EPA Region 1 Coordinator that this process is only the first step with the only goal of potentially occupying the building in September 2011 and that long range plans and goals for continued monitoring and eventual elimination of all PCB Bulk Product Materials and addressing adjacent PCB Remediation Wastes must be developed by Westport Community Schools.

The project to begin removal of interior and exterior identified PCB source materials as PCB Bulk Product Waste began on August 11, 2011. The Contractor was Triumvirate. Triumvirate utilized as sub-contractors Dec-Tam Corporation (Dec-tam) as well as LVI Services (LVI) to assist with the project and maintain the goal of opening school on September 6, 2011. The scope of work included the complete removal of all accessible interior "tectum" ceiling panels and the majority of the associated asbestos and PCB containing mastic/felt on concrete ceiling deck. Work also included complete removal of all PCB Containing interior caulking, all interior PCB containing foam filler, and removal of all exterior PCB Containing window caulking. PCB Containing caulking was removed from interior and exterior door systems to the height of the doors. Interior PCB Containing window glazing compound could not be removed and will need to be part of a future window replacement project; so as an interim measure work included encapsulation of the caulking. Initial phases of work included a thorough cleaning of exterior of all room furnishings utilizing HEPA vacuums and wet wiping to clean potentially PCB laden dust. Once clean wipe samples from representative locations were collected, the furniture was tagged and moved to the gymnasium or exterior storage trailers by a moving company. Locations of carpeting were removed where present with the exception of Office areas and media center offices. Once rooms were emptied, a full negative pressure enclosure was established in accordance with requirements of 453 CMR 6.00 for asbestos removal. Tectum and associated mastic adhesives were removed from all classrooms as well as program spaces such as the cafeteria and media center. Once completed, areas were final cleaned and the ceilings encapsulated with an asbestos encapsulant. Final air clearance samples by Transmission Electron Microscopy (TEM) were collected on rush turnaround to clear the containments. Once final air clearance was achieved for asbestos the work area barriers (wall polyethylene sheeting) were partially removed to facilitate access to interior PCB materials which did not contain asbestos. These materials included interior foam filler, interior caulking and interior window glazing compound. These materials were then removed with the exception of interior window glazing which was encapsulated as an interim measure with a new layer of caulking to conceal the glazing compound.

While interior work was occurring workers removed all of the exterior PCB containing caulking at windows and lower accessible portions of door systems. Containment barriers included use of polyethylene sheeting on interior side of windows and door systems, covering of ground surfaces, and sealing of the unit vents. Workers wore appropriate personal protective equipment. Exterior caulking materials also contained asbestos and required acceptable visual inspection by licensed asbestos project monitors prior to re-caulking of joints.

Upon completion of work to remove or encapsulate source materials, work areas were thoroughly cleaned and representative wipe samples for PCBs were collected within each room on non-porous floors and porous window sills. HVAC systems were cleaned, balanced and run for a period of 12 hours in addition to continued ventilation with HEPA equipped negative air filtration devices. Post removal indoor air samples were collected for analysis using Method T0-1OA Homolog. Samples were collected in all classrooms and function spaces. Work was conducted in phases as each work area was completed.

Results of indoor air samples in general were initially below EPA guidance of 300 ng/m^3. If a room or group of rooms were above the guidance criteria, the rooms were re-cleaned and ventilated for a period before being re-sampled. On September 6, 2011, all classrooms and the Media Center, with a few exceptions, were below the EPA guidance and school opening was allowed on September 8, 2011 after a two day delay to allow maintenance staff and teachers time to prepare rooms for use. Areas which did not initially fall below EPA guidance included Cafeteria, Kitchen area, Office area and a few isolated rooms off the media center, and Room 24. These areas were subjected to additional cleaning and ventilation for several weeks resulting in opening of the Cafeteria, Kitchen and most offices.

Included in this report and management plan is information on some alternatives that Westport Community Schools is considering for long term future plans for the school building. It is recognized by Westport Community Schools that the project undertaken is a first step to eliminate much of the identified sources of PCBs to reduce indoor air concentrations and that full abatement and remediation of PCBs has not been achieved. The first charge of the project was to safely occupy the school in September 2011 in order to begin process of long range plans.

On-going routine cleaning by the school system is occurring with purchased HEPA vacuums and quarterly monitoring of indoor air has been conducted through the school year. The goal of the project, though a significant cost to Westport Community Schools and the Town of Westport, were met to safely occupy the building to conduct required educational programs during school year 2011/2012.

2 Introduction

Fuss & O'Neill EnviroScience, LLC (EnviroScience) was retained to provide inspection, testing, planning and on-site project monitoring for work involving the removal of Polychlorinated Biphenyls (PCBs) and asbestos identified in building materials.

Westport Community Schools was selected as the recipient of funds from the Massachusetts School Building Authority (MSBA) for a Green Repairs Project at the Westport Middle School. The Green Repair Project was to include replacement of existing metal window systems and exterior door systems.

The project team included the following:

EPA Region 1 Coordinator
Westport Community Schools (WCS)
Westport Permanent School Committee (WPSC)
Owner's Project Manager: Pinck & Company, Inc. of Boston, MA (Pinck)
Architect: CGKV Architects of Cambridge, MA (CGKV)
Environmental Consultant: Fuss & O'Neill EnviroScience, LLC of Boston, MA (EnviroScience)

2.1 Background

In May 2011, during preparation for a window replacement project being performed for the Green Repair Program administered under the MSBA, samples of window caulking, window glazing, and door caulking were collected and analyzed for asbestos and polychlorinated biphenyls to determine if these compounds were present in the building materials. The samples were collected by EnviroScience on behalf of the project architect, CGKV.

14.2 PCB Coordinator

A comprehensive PCB control program starts with the appointment of an PCB Coordinator and an PCB Consultant. It is also advisable to retain a PCB Remediation Contractor to handle emergency response action(s).

PCB related work shall take place only with the PCB Coordinator's knowledge; this includes abatement contractor's activities. Emergency situations will be brought to his/her attention as soon as possible after the fact. The PCB Coordinator is the Person who will have overall responsibility for the Operations and Maintenance Plan.

The PCB Coordinator's responsibility shall include coordination with the PCB Consultant and the PCB Remediation Contractor, documentation of response actions, communication with building occupants (where applicable), communication with outside contractors or vendors working at Westport Middle School, ensuring compliance with training of maintenance and custodial employees and periodic visual inspection of PCB materials present in the building and record keeping.

15 Long Range Plan Scenarios for Remediation and Goals

15.1 Renovation Plans

Any proposed removal or renovation potentially involving building materials suspected of containing PCB should be evaluated by the School District. If required to be completed, this should be performed by trained personnel.

Capital plan summary:

Westport Community Schools has been able to get the town and the Massachusetts School Building Authority to support some improvements to our districts school buildings. In Fiscal Year (FY 2013), we were able to complete the replacement of the Macomber School and the High School roofs. These projects came in under budget although it took longer to complete than anticipated. We asked the Town for $2.5 million to replace the roofs and the windows of the Middle School in FY 12. Unfortunately the engineering design phase indicated that the roofs at MAC and WHS would actually use up the $2.5 million allocated to the projects. The projects, thankfully came in at a little over $1 million.

In addition the architect Project team found PCBs in the caulk around the windows and in the glue holding up the sound panels on the ceilings of most of the school. At a cost of $3.2 million, the partial clean-up was very expensive and left us with a school that has to be monitored on a quarterly basis year to year to ensure PCB air and wipe samples remain below the thresholds that the EPA finds acceptable for middle school aged students.

The School Committee and the Board of Selectmen have been asked to support a plan to study and perhaps implement a plan to expand the HS and the Macomber schools in order to allow the schools to abandon the use of the middle school building as a school and renovate the old parts of WHS and Macomber and the Westport

Elementary School (WES). The ultimate plan would be to have the expanded schools to accept a redistributed set of grades so that the Macomber School would become the Macomber Elementary School with grades (PK-3), and the WES would become the Westport Intermediate School with grades (4-6) and the Westport High School would become the Westport Junior/Senior High School with grades (7-12).

A proposed possible schedule is as follows:
FY 14 = Plan Capital Improvements
FY 15 = Expand MACOMBER and WHS
FY 16 = Renovate WES and the old parts of MACOMBER/WHS
FY 17 = Macomber Elementary (PK-3), Westport Intermediate School (4-6) and Westport Jr. /Sr. High School (7-12)

EXHIBIT 21

CGKV Architects, Inc.

204A Hampshire Street
Cambridge, MA 02139
Tel. 617-504-8196
Fax. 617-812-6364

FEASIBILITY STUDY FOR THE ON-GOING USE OF WESTPORT MIDDLE SCHOOL

400 OLD COUNTY ROAD
WESTPORT, MASSACHUSETTS

SEPTEMBER 23, 2013









EXECUTIVE SUMMARY

Westport Community Schools acted with concern and urgency upon the discovery of PCBs at Westport Middle School. The 2011 PCB Source Removal Project was a complex and costly undertaking that removed the majority of PCB Bulk Product Materials, reduced concentrations of PCBs in the air, and allowed for re-occupation of the school in September 2011.

Current conditions at Westport Middle School are not sustainable, however. The presence of remaining PCB Primary Source Materials and PCB Remediation Wastes is subject to United States Environmental Protection Agency (USEPA) and Toxic Substance Control Act (TSCA) regulations. USEPA may demand that remaining PCBs be removed and/or encapsulated at any time.

The purpose of this Feasibility Study is to examine what actions may be necessary to allow the ongoing and long-term use of the building as a middle school facility. If Westport Community Schools decides to continue to use Westport Middle School as a middle school facility, remaining PCB Bulk Product Materials must be fully removed from the building in accordance with USEPA requirements. PCB Remediation Waste, those materials that absorbed PCBs through direct contact with source materials or exposure to contaminated indoor air and/or dust, must also be addressed to allow on-going occupancy of the building by middle-schoolers. PCB Remediation Waste may be either removed completely or encapsulated. CGKV considers a project to fully remove all potential PCB Remediation Waste to be infeasible, at a cost of around $37,900,000. We instead recommend a combination of removal and encapsulation of PCB-contaminated building materials.

Work to address PCB Bulk Product Materials and PCB Remediation Waste can result in, or expedite, other beneficial improvements to Westport Middle School not directly affected by PCBs. Elective improvements such as roof replacement and HVAC upgrades would be a sensible investment in the long term use of the building. Codes and regulations might mandate other building improvements, such as accessibility upgrades, seismic upgrades, or automatic sprinklers.

Options for remediating and renovating Westport Middle School range from a low of around $7,500,000 to a high of around $37,900,000. The estimated cost of constructing a brand new middle school of equal size ranges from $33,000,000 to $38,500,000.

This Study recommends a combination of removal and encapsulation of PCB-contaminated building materials, along with related beneficial improvements to building assemblies and systems that will support the on-going use of the building as a middle school facility. The specific options recommended in this Study have an estimated probable construction cost of around $16,300,000. It is our intention, however, that Westport Community Schools evaluate the full range of issues and options presented in this Study in order to determine possible solutions that will meet the needs of the community as a whole.

CGKV recognizes that public perception will play an important role in determining the future of Westport Middle School. We hope that this Study provides an objective background to help facilitate the community's discussion.

Jason Knutson, AIA
Principal
CGKV Architects, Inc.

K. ESTIMATE OF PROBABLE COSTS

The intention of this Feasibility Study is to identify a range of actions that can be undertaken to allow for the on-going use of Westport Middle School as a middle school facility. It starts with known issues requiring mandatory action, and proceeds to unconfirmed problems and elective actions. The Cost Estimate Options Matrix is organized in similar fashion, providing an estimate of probable construction costs for scopes of work defined in Sections G through J.

Care has been taken to try to quantify estimated scopes of work. However, accurate cost estimates can only be determined during the course of an actual design project, with estimates achieving greater potential accuracy as the design progresses and more facts are known.

CGKV's third-party cost estimator, A.M. Fogarty & Associates (AMF), with assistance from EnviroScience, determined unit prices and calculated probable costs. AMF's raw data is included in Appendix A to this Study. CGKV re-organized the raw cost data into a Cost Estimate Options Matrix in order to categorize the work as follows: Mandatory PCB Bulk Product Removal; Mandatory Identified PCB Remediation Waste, with options for removal or encapsulation; Unconfirmed PCB Remediation Waste, with options for removal or encapsulation; Recommended Elective Improvements; and Possible Mandated Improvements. Costs were rounded to the nearest ten dollars. The Cost Estimate Options Matrix is located at the end of this Section K.

The following Table K-01 summarizes the detailed Cost Estimate Options Matrix. It includes three columns with running totals for the estimated expenses associated with the scope of work recommended by this Feasibility Study, for the highest priced overall scope of work envisioned by this Study, and least expensive scope of work to remove remaining PCB Bulk Products and encapsulate remaining PCB Remediation Wastes.

Table K-01: Summary of Cost Estimate Options

	Recommended Expense	Highest Expense	Lowest Expense
Mandatory Work to <u>Remove</u> Remaining PCB Bulk Products (i.e. – PCB Source Materials)	1,570,420	1,570,420	1,570,420
Running Total:	**1,570,420**	**1,570,420**	**1,570,420**
Work to Address Identified PCB Remediation Waste (i.e. – PCB Contaminated Materials):			
<u>Recommended</u> Work to Remove Some but Encapsulate Most PCB Remediation Waste	4,414,840		

Maximum Removal of PCB Remediation Waste		18,726,130	
Maximum Encapsulation of PCB Remediation Waste			3,132,610
Running Total:	**5,985,260**	**20,296,550**	**4,703,030**
Work to Address Unconfirmed PCB Remediation Waste (i.e. – PCB Contaminated Materials):			
Recommended Maximum Removal of PCB Remediation Waste	2,128,510	2,128,510	
Maximum Encapsulation of PCB Remediation Waste			1,751,010
Running Total:	**8,113,770**	**22,425,060**	**6,454,040**
Elective Facility Improvements:			
Roof Replacement	2,040,000	2,040,000	
Exterior Envelope (Brick) Repairs		206,500	
Acoustical Ceiling Treatments at Exposed Concrete	626,550	626,550	
Replace Auditorium Seating and Carpet		202,450	
Re-Build Exterior Site Brick Walls		267,110	
Replace Unit Vents and Air Handlers	2,033,200		
Replace HVAC System in its Entirety		6,256,000	
Replace Electrical, Data, and Communications System in its Entirety		2,346,000	
Running Total:	**12,813,520**	**34,369,670**	**6,454,040**
Possible (Likely) Mandated Improvements:			
Accessibility Improvements	2,500,000	2,500,000	1,000,000[1]
Structural / Seismic Upgrades	Unknown[2]	Unknown[2]	0[3]
Automatic Sprinkler System	1,000,000	1,000,000	0[3]
Running Total:	**16,313,520**	**37,869,670**	**7,454,040**

Note[1]: As discussed in Section J, a project costing greater than 30% of the assessed building value triggers the requirement for full compliance with 521 CMR. It is likely that variances will be requested from AAB in order to avoid full compliance and minimize the added cost of accessibility improvements. It is not possible to predict the outcome of a variance request and the resulting cost of necessary improvements. $1,000,000 used here is a very rough estimate.

Note[2]: Original Construction Documents do not indicate design loads, and possible structural and/or seismic improvements cannot be readily determined at this time without identification of the scope for an actual construction project and detailed engineering.

Note[3]: Lowest expense is $0 if these improvements are not mandated.

It is critical to note that the costs listed in these charts and tables are estimates of probable construction costs only. They do not include additional project costs, such as designer fees, permits, and project management costs, that would be part of any renovation project. Project costs can add around 15% to the construction costs.

The estimates of probable construction cost are based on 2013 costs. An escalation factor should be applied for a project undertaken further into the future to account for inflation and other potential cost increases.

Only the highest priced option would remove all PCB Remediation Waste and eliminate the current building use restrictions. All other options would require on-going monitoring and adherence to an operations and maintenance program to ensure the health and safety of building occupants, with an estimated yearly cost of around $75,000. This cost, too, might escalate over time.