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Date:	July 19, 2011, Revised September 15, 2011
To:	Sandy Mathews, Larry Walker Associates
From:	Peter Mangarella and Will Lewis, Geosyntec Consultants
Subject:	San Francisco Estuary Program PCBs in Caulk Project Task 2.3 Research Results Final Technical Memorandum Geosyntec Project Number WW1384

BACKGROUND

In April 2007, the State Water Resources Control Board awarded the Association of Bay Area Governments/San Francisco Estuary Partnership (SFEP) a Proposition 50 Coastal Nonpoint Source Pollution grant known as the "Taking Action for Clean Water" project to further implementation of several Bay Area Total Maximum Daily Loads (TMDLs). One of Taking Action for Clean Water projects is the "PCBs in Caulk" project, which will create a management process to keep PCBs in historic building materials, specifically uncontained materials like sealants and caulking, out of urban runoff as partial implementation of the TMDL for PCBs in San Francisco Bay. After the California bond project freeze in 2008-9, the grant was transferred to the State Revolving Fund under the American Recovery and Reinvestment Act of 2009 (ARRA) In October 2009, the San Francisco Bay Regional Water Quality Control Board (RWQCB) adopted the Municipal Regional Stormwater NPDES Permit (MRP), which includes Provision C.12.b.ii (3) requiring that permittees "develop/select BMPs to reduce or prevent discharges of PCBs during demolition/remodeling." SFEP contracted with Larry Walker Associates (LWA) to assist in the development of a process to manage PCBs in caulk during building demolition or renovation (i.e., the PCBs in Caulk Project).

The purpose of this memorandum is to provide the results for Task 2 of LWA's portion of the PCBs in Caulk Project (corresponding to Task 7.5.3.2 in the Taking Action for Clean Water master grant agreement). For this task, Geosyntec researched existing regulatory controls and

policies related to managing wastes and hazardous materials during building demolition and/or remodeling programs and their current level of implementation.

APPROACH

Task 2 was guided by the following three research questions:

1. What are the current local, state and federal ***regulatory controls/policies*** for regulated constituents used in building materials or construction, including but not limited to PCBs in caulk, asbestos and lead?

2. Based on follow-up interviews, what is current level of ***implementation*** of regulatory controls for PCBs in caulk in the Bay Area, including local ordinances, building inspector training, removal and disposal practices, and documentation and reporting requirements?

3. What are the ***types and ages of buildings where PCB-containing caulk is likely to have been used in the Bay Area***, and to what extent can existing building inventory databases be used to address this question?

The research approach consisted of two steps. First, Geosyntec conducted a website review of local, state, and federal regulatory controls/policies for currently regulated constituents in building materials, including but not limited to PCBs, asbestos, and lead. Geosyntec also worked with TDC Environmental and LWA to identify relevant information from the wealth of pre-project materials assembled during prior related research. Geosyntec then conducted follow-up phone interviews with regulators, municipalities, and other agencies regarding the current level of implementation of the regulatory controls in the Bay Area. Such controls included local ordinances, building inspector training, removal and disposal practices, and documentation and reporting requirements. As part of the phone interviews, we discussed the availability of building inventory databases and the information contained in those databases.

RESULTS

Research Question #1

This section summarizes the findings for the first research question, which assessed the current local, state, and federal regulatory controls and/or policies for currently regulated constituents used in building materials or construction, with the focus on PCBs, asbestos, and lead.

Federal PCB Regulations

Building materials containing PCBs are regulated at the federal level under the Toxic Substances Control Act (TSCA) of 1976 (15 U.S.C. 2605) and subsequent amendments. EPA has issued regulations to implement TSCA in 40 CFR 761.[1][2]. EPA regulations include a list of "authorized" uses for PCBs, primarily associated with electrical equipment that has not been removed from service. Building caulk is not on the list. If PCBs are found at a concentration greater than 50 parts per million (ppm) in an item not on the list of authorized uses, the use is considered "unauthorized." Once discovered, unauthorized PCBs must be removed from service and properly disposed. Since caulk is an "unauthorized" PCB use if it contains >50 ppm PCBs EPA regulations require it to be removed.

EPA published, on April 7, 2010, an Advance Notice of Proposed Rulemaking (ANPRM) informing the public about an agency reassessment of its PCB regulations, including how the agency regulates PCBs in caulk. If EPA elects to propose changes to its regulatory structure for PCBs in caulk, these changes would take several years to implement.

There are no federal requirements to test caulk or other building materials suspected of containing PCBs prior to removal or handling. However, if a specific building material is tested, and if PCB concentrations are found to be greater than or equal to 50 parts per million (ppm), the material, whether or not it has been disturbed or removed, is then considered "waste" that must be removed, properly characterized, and disposed of in accordance with 40 CFR 761.

PCB Waste Management

EPA PCBs regulations in 40 CFR Section 761, which address PCB waste, separate materials into "PCB bulk product waste" (40 CFR Section 761.62) and "PCB remediation waste" (40 CFR Section 761.61). PCB bulk product waste are products that contained PCBs when they were put into service (e.g., caulk). PCB remediation waste is any other material—like concrete or soil—that has been contaminated with PCBs.

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[1] 40 CFR 761: Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions. http://www.access.gpo.gov/nara/cfr/waisidx_07/40cfr761_07.html.

[2] A summary of planned EPA rulemaking, proposed rules, comment periods, and final rules can be found online at the following link: http://www.epa.gov/epawaste/hazard/tsd/pcbs/pubs/laws.htm

PCB Bulk Product Waste

Caulk containing PCBs at ≥ 50 ppm, and masonry, wood, metals, and other building materials that are purposely coated with caulk containing PCBs at ≥ 50 ppm, are considered PCB bulk product waste. EPA retains the responsibility for overseeing the removal of PCB bulk product waste under 40 CFR Section 761.62 where Federal requirements for disposal of PCB bulk product waste are presented. According to 40 CFR Section 761.6, PCB bulk product waste must be disposed of at the Federal level in one of three ways: 1) performance-based disposal, 2) disposal in a solid waste landfill, or 3) risk-based disposal. California law, however, contains significant additional restrictions on disposal of materials containing PCBs in concentrations ≥ 50 ppm that are discussed in a subsequent section titled California PCB Regulations. California law does not allow 2) disposal in a solid waste landfill and 3) risk-based disposal leaving performance-based disposal the only option for PCB bulk product waste.

Performance-based disposal allows for disposal of PCB bulk product waste in a TSCA-certified incinerator or chemical waste landfill, a RCRA hazardous waste landfill, a RCRA hazardous waste landfill, or under a TSCA-approved alternative disposal method (in this latter case the disposal method would have to meet California's Title 22 requirements discussed in later sections).

PCB Remediation Waste

Building materials surrounding caulk or adjacent soils that have been contaminated with PCBs at concentrations ≥ 50 ppm are considered PCB remediation waste and are subject to the cleanup and disposal requirements in 40 CFR Section 761.61. According to EPA regulations, at the Federal level PCB remediation waste must be disposed of in one of three ways: 1) self-implementing cleanup and disposal, 2) performance-based disposal, or 3) risk-based cleanup and disposal. Again, California law contains additional restrictions on disposal of PCB remediation waste that are discussed in a subsequent section titled California PCB Regulations.

Permissible Exposure Limits

The Occupational Safety and Health Administration (OSHA) has established a Permissible Exposure Limit (PEL), the maximum exposure a worker can legally encounter, for two specific PCB congeners: Aroclor 1242 (1 milligram per cubic meter of air (1 mg/m^3)) and Aroclor 1254 (0.5 mg/m^3) (29 CFR 1910.1000). The National Institute for Occupational Safety and Health

(NIOSH) recommends a PEL of 1 ug/m^3, which is 1,000 times less than the OSHA standard (NIOSH, 1988). EPA has established a Cancer Risk Level at 0.00001 mg/m^3 based on toxicological studies or risk assessment values (EPA Air Toxics, 2000).

Correlating these limits to PCBs in caulk is difficult because exposure is a function of, among other things, PCB concentration in caulk, caulk condition, and indoor air mechanics for a specific building or area of a building. These regulations and best management practices for worker safety are implemented through appropriate Personal Protective Equipment (PPE) that may include protective clothing or respirators, though these have little bearing on limiting the release of PCBs to the environment.

California PCB Regulations

PCBs in Wastes

The California State Department of Toxic Substance Control (DTSC) is the delegated state authority that regulates the generation, storage, transportation, and disposal of PCBs. The delegated authority relates only to waste management (under the Resource Conservation and Recovery Act or "RCRA"). (EPA has not delegated to the state authority to implement the TSCA PCBs regulatory programs described above.). California Code of Regulations (CCR) Title 22 Section 66262 describes the regulatory requirements for waste generators and defines waste as any discarded material in any form.

EPA views PCB containing material as "waste" because of PCB concentration (≥ 50 ppm) while California's Title 22 is only triggered once the decision to dispose of a waste has been made. Some ***renovation material*** considered "waste" (PCB remediation waste specifically) by EPA because of PCB concentration, could be allowed to remain in place (i.e. due to limited occupancy and exposure) if a cleanup program is deemed satisfactory by EPA Region IX PCB Coordinator. Material left in place would not be disposed of and, therefore, would not trigger Title 22. All ***demolition material*** identified for disposal that is considered "waste" by EPA would also be considered "waste" under Title 22.

The parties legally responsible for a demolition or renovation project that generates bulk material that may contain PCBs are required to demonstrate whether the waste is hazardous or not under Title 22. Generators can demonstrate that waste is not hazardous through any number of methods, ranging from analytical laboratory tests to records reviews showing that the waste is not

likely to be hazardous due to the age and source of the material or caulk. For instance, a waste generator could demonstrate that caulk used on the building is from after 1978 and therefore likely does not contain any PCBs.

Generators of wastes suspected of containing PCBs are required to test a representative bulk waste sample using at least one of two methods (CCR Title 22, Chapter 11, Section 66262.11). Waste generators are required to use the Method 1311 from EPA Publication SW-846, a strong acid digestion, to determine the PCB concentration in waste. If the concentration of PCBs is greater than or equal to the Total Threshold Limit Concentration (TTLC) of 50 ppm in the digested material extraction, the waste is considered hazardous (CCR Title 22, Chapter 10 Section 66261.24). If the concentration of PCBs in the waste is below 50 ppm, the waste is considered non-hazardous.

A second test presented in Method 1311 from EPA Publication SW-846, uses a weak acid digestion and is performed in cases where the strong acid digestion has indicated that the waste is not considered hazardous under the strong acid digestion test. The weak acid digestion measures the extent to which contaminants contained in the bulk product will dissolve if exposed to water. The weak acid digestion test is largely designed to determine whether landfill leachate will be adversely affected by the presence of the specific waste. If this test indicates that the concentration of PCBs in the effluent is greater than or equal to the Soluble Threshold Limit Concentration (STLC) of 5 ppm , the waste is considered hazardous (CCR Title 22, Chapter 10 Section 66261.24). A waste generator may be allowed to forgo the STLC if the results of the TTLC are sufficiently low, indicating a low likelihood of exceeding 5 ppm STLC for the weak acid digestion. Criteria for such an exception are found in Title 22 66261.24 and the process for making a determination is found in Title 22 66262.11.

It is important to differentiate between the Federal EPA 40 CFR 761.62 threshold of greater than or equal to 50 ppm in a specific building material and the broader and integrated bulk waste threshold of greater than or equal to 50 ppm established under CCR Title 22 66261.24. EPA PCB regulations refer to specific building materials that are suspected of containing PCBs, such as caulk, fluorescent light ballasts, and acoustic panels. In contrast, Title 22 regulations focus on the PCB concentration of bulk wastes that may contain a mixture of high concentration PCB materials and other demolition material (e.g., concrete). California landfills accepting bulk demolition and renovation wastes currently do not implement load check programs to identify whether PCB containing caulk is present in disposed material, or if the bulk waste exceeds the

STLC or TTLC for PCBs. An unknown mass of PCB containing caulk and PCB Remediation Waste (concrete, mortar, etc), that would be considered hazardous waste by EPA under 40 CFR 761.62, is possibly entering non-hazardous waste landfills (non-RCRA or non-TSCA) along with a sufficient quantity of uncontaminated waste to dilute the bulk waste and keep PCB concentrations below Title 22's TTLC and STLC. Regulatory requirements for demolition/renovation, stockpiling, and transport activities that do not fall under Title 22 are far less stringent than those that apply to Title 22 California Hazardous Waste; and, if Federal regulations are not triggered, disposal in solid waste landfills may allow for PCB release to the environment.

California hazardous waste, defined as bulk material with PCB concentrations that are greater than or equal to the TTLC of 50 ppm or the STLC of 5 ppm, must be sent to a hazardous waste facility. The California Department of Toxic Substances Control has compiled a list of commercial offsite hazardous waste facilities on their website at: http://www.envirostor.dtsc.ca.gov/public/commercial_offsite.asp. As of 2010, landfills listed are in Kettleman City (Kings County), Buttonwillow (Kern County), and Westmorland (Imperial County). Some PCB waste may be transported out of state if all conditions of RCRA are met.

PCBs in Water

PCBs are also regulated by the State under federal and state clean water laws and regulations. U.S. EPA has established a numeric water quality objective for California surface waters, including San Francisco Bay, of 0.00017 ug/L total PCBs in water. U.S. EPA has approved a San Francisco Bay RWQCB Total Maximum Daily Load (TMDL) for PCBs entering San Francisco Bay that establishes the total mass of PCBs that can enter the Bay via stormwater without adversely affecting beneficial uses such as resident fish consumption.[3] The San Francisco Bay PCB TMDL specifies a target for the total concentration of PCBs in bay sediments (1 ppb). The TMDL was adopted as an amendment to the Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan). The Basin Plan amendment includes the waste load allocations for various categories of dischargers, including municipal stormwater dischargers, and requirements to meet those allocations are specified in the MRP.

[3] San Francisco Bay Regional Water Quality Control Board Resolution No. 2009-0076.

Local PCB Regulations

There do not appear to be any local government regulations addressing PCBs. Several Bay Area municipalities have adopted general policy resolutions to reduce or eliminate Persistent Bioaccumulative Toxins including PCBs; however, no City or County regulation of PCBs in caulk has been identified by the LWA team. The remainder of this section discusses local regulations concerning demolition and renovation activities.

Demolition and renovation of buildings requires a permit issued by the Building Department of the local jurisdiction where the project is located. The name of the permit (they may not be referred to as demolition or renovation permits), the scope of the permit and form of the permit will vary from jurisdiction to jurisdiction. For example, in the City of San Jose, a demolition permit is required for demolition or renovation that affects any structural feature of a building (but does not apply to demolition or renovation of single family homes). Implementation includes city inspection of the site following demolition to ensure that the demolition was complete and conducted in compliance with the permit. Some municipalities have adopted construction debris ordinances that require that a percentage of demolition waste (for example concrete) be recycled or reused to divert it from landfills.

Municipalities may require permits for window replacements. Specific requirements vary. For example, San Mateo County and the City of San Mateo require permits for window replacement except for window replacements that are "like for like" and do not break through stucco or frame. Alameda County requires a permit for any window replacement. Replacing only the window glass (and not the frame) usually does not require a demolition permit; however some agencies such as Alameda County do require a permit for any window replacement strictly for the purpose of ensuring that labeling and certification requirements of the California Energy Code are met. Because municipalities have limited practical methods for enforcement of permit requirements for small jobs, it is unclear what fraction of window replacements comply with permit requirements.

Relevant Asbestos Regulations

Asbestos is a mineral fiber that historically was used for insulation and as a fire-retardant in a variety of building construction materials (roofing shingles, ceiling and floor tiles, paper products, and asbestos cement products). When asbestos-containing materials are damaged or disturbed by repair, remodeling or demolition activities, microscopic fibers can become airborne

and can be inhaled into the lungs, where they can cause significant health problems (EPA Asbestos Portal, 2010).

At the federal level, National Emissions Standards for Hazardous Air Pollutants (NESHAPs) have been established under Section 112 of the Clean Air Act (CAA) to provide processes, procedures, and protocols to be followed when abating Asbestos Containing Material (ACM) (40 CFR 61, Subpart M). Additionally, the Asbestos Hazard Emergency Response Act (AHERA, 1986) provides a process, procedure, and protocol to be followed when abating ACM in schools. AHERA is used by the abatement industry as the standard of care to be followed when designing and executing abatement projects with a focus on protecting both the workers executing the abatement work and the nearby populations during the abatement.

The lead state agency in managing asbestos associated with building demolition and renovation is BAAQMD. The Bay Area Air Quality Management District (BAAQMD) requires notification of the demolition of a "structure" or renovations removing greater than 100 square feet of asbestos material within the San Francisco Bay air basin. BAAQMD retains delegated authority from EPA with respect to addressing the release of asbestos.

Although the number of notifications received by the BAAQMD will vary depending on economic conditions, they receive nominally about 5,000 to 6000 notifications per year, of which about one half are demolition and one half are for renovations (Dennis Baker, personal communication with K. Moran, 2007). For the City of SF, the largest affected municipality, they received about 146 demolitions and 431 "asbestos jobs" (renovations) in 2007.

The BAAQMD requires the submission of an application (a simple, single-page application form describing the work, location, and duration) and an application fee (ranging from $234 for all non-single family residential buildings with more than 10 days prior BAAQMD notice to $390 with less than 10 days prior BAAQMD notice). BAAQMD then issues a "J-number" that contractors must provide to the local agency prior to the initiation of demolition or renovation work. The issuance of a J-number from BAAQMD is the means by which BAAQMD can collect permit fees, track the start and finish of abatement projects (thereby providing an opportunity for jobsite inspection), and ensure the abatement contractor is aware that certain regulations must be followed during the abatement work. No reporting or inspection requirements flow from the issuance of a J-number. BAAQMD defines demolition as the wrecking, dismantling or intentional burning of a structure. Renovation is defined as an operation other than demolition in

which Regulated Asbestos Containing Material (RACM) is removed or stripped from any element of a building or structure (BAAQMD Regulation 11, Rule 2).

BAAQMD has established that if materials are found to contain asbestos above 1%, the contractor must handle, abate, and dispose according to BAAQMD Regulation 11, Rule 2. If asbestos concentrations are below 1%, no special handling or disposal is required. A pre-abatement survey is required to be conducted to identify ACM. BAAQMD Regulation 11-2-303.8 requires that a survey be performed prior to demolition to determine the presence of RACM. The person who performs the survey must be Cal-OSHA certified and must have taken and passed an EPA approved building course (BAAQMD, 2009)[4]. The survey consists of collecting samples of suspect material (e.g., mastic, tile, roofing material, or joint compound) and submitting for laboratory analysis. A report is prepared that documents sampling results and presents protocols to be followed during the abatement process.

CCR Title 8 calls for strict asbestos worksite control, including: access/egress restrictions; signage; covering floors and furniture with plastic sheeting; worker protections (typically Tyvek suits and respiratory protection); and establishment of a negative pressure containment area (vacuum pumps, filters, and plastic sheeting with duct tape). (CCR Title 8, Construction Safety Order, Article 4. Dusts, Fumes, Mists, Vapors, and Gases, Section 1529).

Despite the strict jobsite and worker safety controls, generally defined by NESHAPs, AHERA, and CalOSHA, there are no submission requirements to documentation proper abatement. The industry standard is a visual inspection and leaving the abated area clean (use of a high efficiency particulate air (HEPA) vacuum; can be as simple as a shop-vac). Cleaning can be followed by application of a stabilization or encapsulation material (foam, putty, or other appropriate material). Contractors can also clear a recently abated area by collecting air samples from within the work area to check for the presence of airborne asbestos fibers. There are no requirements to submit results of the clearance sample monitoring.

Despite the fact that a closeout report is not required to be submitted to any regulatory agency, building owners typically have consultants prepare a closeout report that summarizes the abatement work, worker health and safety measures, results of visual inspection, and presentation

[4] A survey is not required for residential buildings having four or fewer dwelling units, though testing of certain materials is required if they are removed or disturbed.

of any air sampling results. The owner will typically keep copies of the report to help manage potential future legal claims from former workers or adjacent populations.

Relevant Lead Regulations

OSHA is the primary federal oversight agency for dealing with lead based paint. Paint with "any detectable lead" must be handled and disposed of appropriately. Prior to demolition or renovation projects, suspect material must be tested. Removal of "peeling and cracking" paint prior to demolition or renovation is the typical process. Lead-containing paint that is not peeling or cracking can be stabilized in place with special paints in renovation-type projects. Worker training and protection requirements are defined by OSHA and CalOSHA.

Under a new EPA rule, beginning April 22, 2010 contractors performing renovation, repair and painting projects that disturb lead-based paint in homes, child care facilities, and schools built before 1978 must be certified and must follow specific work practices to prevent lead contamination. EPA requires that firms performing renovation, repair, and painting projects that disturb lead-based paint in pre-1978 homes, child care facilities and schools be certified by EPA and that they use certified renovators who are trained by EPA-approved training providers to follow lead-safe work practices (40 CFR 745.80, Subpart E).

At the State level, lead paint removal may require one or two closeout processes involving different agencies. A brief report is submitted to the California Department of Public Health (CDPH) that describes the project, worker controls, and disposal process/waste stream management (DPH-07-003 - Requirements for Lead-Based Paint Activities). Under TSCA, DTSC and EPA may require testing of surface soil within the dripline of a recently demolished structure that contained lead-based paint. Results of sampling can lead to required excavation of affected surface soil (6 inches to 1 foot) and additional sampling and reporting of the results (DTSC Lead-Based Paint and/or Electrical Transformer Investigation).

Research Question #2

Follow-up interviews were conducted to investigate the current level of implementation of regulatory controls in the Bay Area, including local ordinances, building inspector training, removal and disposal practices, and documentation and reporting requirements.

The goal of the phone interviews was to gain some understanding of how the various municipal and regulatory agencies interact to implement the regulatory requirements for PCBs, asbestos, and lead management for demolition and remodeling projects. The interviewees were selected to cover a broad range of those involved, including regulators at the state level, local municipal agencies concerned with projects involving both publicly and privately owned buildings, and environmental consultants. Table 1 provides a list of the interviewees.

Table 1: Interviews Conducted for Task 2

Contact	Position	Affiliation	Contact information
Carmen Santos	PCB Coordinator	USEPA Region IX	(415) 972-3360 Santos.Carmen@epa.gov
Charles Corcoran	Chief, Waste Identification and Recycling Section.	California Department of Toxic Substances Control	(916) 327-4499 CCorcora@dtsc.ca.gov
Brent Rudin	Supervising Air Quality Specialist, Compliance Assistance	BAAQMD	(415) 749-5128 BRudin@baaqmd.gov
Jason Garrison	Environmental Project Manager	County of Alameda General Services Agency	(510) 208-9520 Jason.garrison@acgov.org
Geoffrey Blair	Associate Engineer	City of San Jose Municipal Compliance Division	(408) 975-2576 Geoffrey.blair@sanjoseca.gov
Michael Mena	Planner II	City of San Jose Planning Division	(408) 535-7907 Michael.mena@sanjoseca.gov
John Wolfram	Senior Engineer	City of San Jose Building Division	(408) 535-7758 John.wolfram@sanjoseca.gov
Chuck Bove	Principal	Vista Environmental, LLC	925-948-5097 chuckbove@vista-env.com

An interview form was developed for the municipal agencies that contained the following three questions:

Question 1: What permitting and other requirements does your agency require for builders and contractors who plan to demolish or renovate commercial or industrial buildings that are

expected to contain PCBs in the building materials? Please comment on the process, approvals, and inspections that are conducted and what departments are involved.

Question 2: For comparison purposes, could you comment on similar requirements where asbestos or lead may be contained in the buildings?

Question 3: Does your agency maintain a building database that includes information (such as location, age, owner, and current and past usage of building) that could help determine if it may contain PCBs in building materials?

For interviewees affiliated with other agencies, or follow-up with different departments in the same agency, the questions varied to best obtain the perspective of the interviewee and their agency or department.

The following summarizes key findings from each interview.

Carmen Santos, PCB Coordinator, USEPA Region IX

Carmen Santos from EPA Region IX addressed the regulatory requirements derived from the Toxic Substances Control Act (TSCA), a statute written to address a wide range of toxic substances, as applies to PCB-containing materials encountered during building demolition and renovation.

PCBs have been found in several building materials such as caulk, sealants, paints, electrical wiring insulation, and fluorescent light ballasts. PCB-containing caulk (or PCB caulk) has been found to be present in buildings or structures constructed between 1950 and 1978.

PCB containing caulk is regulated for disposal by TSCA in 40 CFR 761.62 as PCB bulk product waste if the caulk contains PCBs at concentrations equal to or greater than 50 ppm. This regulation establishes three options for disposal of PCB caulk and other PCB bulk product wastes. Disposal of PCB caulk must also meet disposal requirements from state and local regulatory agencies. State disposal requirements for PCBs may be more stringent than TSCA requirements. For example, the state of California regulates PCBs as a hazardous waste and may not allow disposal of PCB caulk in municipal solid waste landfills which is a disposal option for PCB caulk in 40 CFR 761.62.

Testing of the caulk for PCBs is not required in the current TSCA PCB regulations. However, if caulk is found to contain PCBs at or greater than 50 ppm, the PCB-containing caulk needs to be

removed because its continued use is not authorized under TSCA. Removal of PCB-containing caulk does not require an approval from EPA.

The substrate (e.g., concrete) that has been in contact with the PCB caulk (or other PCB-containing materials such as paints or sealants) may be contaminated with PCBs that migrated or leached from the caulk into the substrate. This contaminated substrate is regulated as a PCB remediation waste and would be subject to PCB cleanup and disposal requirements under 40 CFR 761.61 (PCB Remediation Waste). The cleanup plan for the substrate is subject to EPA approval under that section of the TSCA regulations. Requirements for cleanup plans are presented in 40 CFR 761.61(a) (self implementing cleanup) and 761.61(c) (risk-based cleanup) and require characterization of the PCB contaminated materials, a written and signed certification, development of a cleanup plan, and depending on the cleanup option, a prospective risk-based evaluation. The TSCA cleanup must result in no risk of injury to health or the environment.

PCB caulk and other materials (e.g., sealants, paint) containing PCBs may be encountered during renovation of structures (e.g., buildings) necessitating best management practices (e.g., interim actions) to reduce exposure to building occupants and responsible management of the PCB caulk and potentially contaminated substrates (e.g., concrete, wood). Cleanup of PCBs may be necessary during renovation projects if PCB caulk has contaminated the material that was in contact with the caulk. Indoor air sampling is strongly recommended during renovation of occupied buildings to determine if PCB levels in air are above acceptable limits and whether building occupants and workers are being exposed to PCBs through inhalation.

To facilitate understanding best management practices (BMPs) for PCBs in caulk, EPA has published several fact sheets at http://www.epa.gov/pcbsincaulk. Best management practices include interim actions or steps to prevent or minimize exposure to PCBs and, among other factors, BMPs take into account the physical condition of the PCB caulk.

If a structure (e.g., building) is going to be demolished, the substrates that were in contact with PCB caulk (or other PCB containing material) need to be tested to determine the PCB concentration for proper disposal. Disposal of PCB contaminated building substrates (e.g., concrete) is regulated under 40 CFR 761.61 (PCB remediation waste).

During both renovation and demolition scenarios, soils in proximity to the building or structure should be tested to determine if PCB caulk and / or other PCB containing materials (e.g., paint

chips) have contaminated these soils. If the soils are found to be contaminated with PCBs, these soils are considered PCB remediation waste.

Asbestos and lead are also addressed under TSCA and the State of California likely has certification programs for contractors engaged in removing these materials. Carmen's experience with the removal of PCB caulk and paints has involved a number of BMPs that are similar to those used during removal of lead paint and asbestos such as isolating the area subject to cleanup and providing negative pressure. One project focused on removing sealant containing PCBs on a contaminated wall at concentrations up to 20,000 ppm. The project employed methods typically used for lead paint removal (an abrasive such as red sponge media blasting) and in general met cleanup levels of less than or equal to 1 ppm. Abrasives and other decontamination methods may be used to remove PCB contamination from substrates contaminated with PCBs that migrated from the caulk into the substrate.

In Region IX they have heard very little about PCBs in caulk though the issue is more widely discussed in other regions. It is unclear whether this is because of the lack of sampling and testing or limited reporting to EPA.

Charles Corcoran, Office of Policy, Department of Toxic Substances Control

Charles Corcoran is the Chief of the Waste Identification and Recycling Section in the Office of Policy at DTSC headquarters in Sacramento.

The generator of a "waste" has a "responsibility" to determine if its waste is hazardous waste. Generators may determine that their wastes are not hazardous wastes through use of knowledge or through testing. An example of generator knowledge is using records that show that the caulk used on the building does not contain any PCBs.

The Total Threshold Limit Concentration (or TTLC) applies to the sample results from a strong acid digestion. If the total concentration of PCBs is greater than or equal to the TTLC (50 ppm), the waste is hazardous waste. If the waste contains below 50 ppm PCBs, and is not hazardous via any other criterion, then the waste is non-hazardous waste.

The Soluble Threshold Limit Concentration (or STLC) applies to the sample results from a weak acid extraction. Samples of the waste are placed in solution to determine whether contaminants in the waste are soluble. The WET (Waste Extraction Test) is intended to determine whether landfill leachate will be contaminated to the extent that it poses a threat. If the soluble

concentration of PCBs is greater than or equal to the STLC (5 ppm), the waste is hazardous waste. The WET need not be performed if the results of the total digestion support that the maximum theoretical concentration that may be measured by the extraction is less than the STLC.

DTSC does not regulate demolition or renovation. DTSC does not require caulk and other building materials to be sampled and analyzed prior to becoming "waste(s)."

DTSC did adopt an STLC for asbestos. DTSC has adopted an STLC and TTLC for lead.

Charles stated that there is no uniform set of regulations for building demolition. Owners and contractors must refer to several sets of requirements during a demolition project.

Brent Rudin, Supervising Air Quality Specialist, Toxics Section, Bay Area Air Quality Management District

Brent Rudin stated that BAAQMD's primary delegated authority from EPA is to address the release of asbestos to protect human health. All demolition projects within BAAQMD's jurisdiction are required to report any renovation or demolition of a structure (structures can be widely defined and include items such as transmission lines). It is important to note that while local building departments have different definitions of demolition, notification of BAAQMD is required when an activity meets BAAQMD's definition of demolition, which is the removal of any structural (weight bearing) component. If you knock a wall out in a residential home, you must inform BAAQMD. Renovation is defined as the removal of greater than 100 square or linear feet of material and requires notification of the BAAQMD. The BAAQMD area/length standard triggering notification is more stringent than the federal NESHAPs standards.

The BAAQMD does not directly regulate PCBs but they are aware of materials that contain PCBs. Corrugated steel buildings are often associated with a tar-like material called "galvestos" that contains PCBs and asbestos. Caulk often contains asbestos and is then addressed by BAAQMD. BAAQMD does not have a regulatory mechanism to require testing for PCBs, but they have informed agencies that do hold that authority about the presence of PCB-containing materials.

The delegated authority for lead in paints is typically the local building permitting agency or, in its absence, the local health department under SB 460 Chapter 931. Regulations drawing from

SB 460 Chapter 931 address specific building components containing lead to determine appropriate action.

Geoffrey Blair, City of San Jose Environmental Compliance Division

Geoff Blair works in the City of San Jose Environment Compliance Division, which assists the City in property transfers involving municipal purchases and sales. Geoff acts as an in-house technical consultant to city staff primarily on issues related to site contamination (soils and groundwater) but also contamination that might be related to building materials. He is not involved in the building permitting process and he suggested talking with someone in the Building Department. (see following notes from interview with John Wolfram, City of San Jose, Building Division).

In response to Question 1, Geoff was aware of the concern of liquid PCBs that might be contained on site in old transformers, but was not aware of the possibility of having bulk PCBs that could be contained in building materials, including caulk. He was not aware that the City of San Jose has a management program to address PCBs in building materials but suggested contacting the Building Department for more information.

In response to Question 2, Geoff referred Geosyntec to the Building Department for actual permitting requirements. Geoff indicated that asbestos and lead-based paint were mature programs with certified licensed contractors who were generally aware of the regulatory requirements and that the City relied on the abatement contractors to follow the correct procedures in conducting surveys, abatement activities, monitoring during abatement, and disposal. For sites suspected of containing lead-based paint on the exterior of buildings, the City requires lead sampling in soils around the perimeter of the structure to determine if paint chips have peeled off and deposited on surrounding soils. If lead concentrations exceed screening levels, a remedial action work plan is typically prepared by the local agency (or by owner/developer's consultant) and if the contamination is significant, regulatory oversight and approval is obtained from the DTSC. Remedial actions typically include excavation and off-site disposal at an appropriate landfill or capping with impervious surfaces such as pavement or clean soil. Capping often requires placing a deed restriction on the property to protect the cap from being disturbed and restricting certain uses such as day care centers, hospitals, and schools.

In response to Question 3, Geoff indicated that the Department of Planning, Building, and Code Enforcement maintains a parcel/address-based database that can be accessed by City staff and the public through an in-house web-based development services portal that contains information on

permits that have been applied for. This database can be used to estimate building age and usage, information that could support a screening process for buildings that may contain PCBs.

Michael Mena, City of San Jose Planning Department

Michael Mena has nine years of experience working with the City of San Jose Planning Division. He explained that there are two phases of permitting: permits related to the planning phase of a project, followed by the building permit phase. The planning permitting requirements for a demolition or major renovation trigger a requirement for a Site Development Permit (when the site is in a conventionally-zoned area), a Plan Development Permit (when the site is part of a planned development district), or a Conditional Use Permit. The time required to obtain such permits can vary from over the counter approval for small projects, to more than one year because of the building planning process for replacement of the structure. All permits require public hearings and have different approval requirements. All require CEQA reviews in which mitigation may be specified for contaminants that may be contained in building materials. In his experience, most mitigation for such contaminants calls for compliance with the existing regulations governing asbestos and lead abatement. Michael was not aware of any city ordinance specific to the management of PCBs during demolition or renovation.

John Wolfram, City of San Jose Building Division

John Wolfram is a senior engineer in the City of San Jose Building Division. The following is a summary of his interview. After obtaining the necessary planning permits and approvals, the owner/developer applies for a building or demolition permit, which requires that the project meet all mitigation identified in the CEQA analysis and all other regional and state regulatory requirements, including management of hazardous materials that may be contained in building materials. Again, the time required for obtaining the demolition permit will vary depending on the scale and type of project. With respect to asbestos, the Building Division provides an Informational Handout that directs the applicant "prior to demolishing structures, or prior to any renovation that will potentially make asbestos containing materials friable" to notify the BAAQMD. For asbestos, the BAAQMD requires an application be completed and payment of a fee. The BAAQMD then issues an Acknowledgement Letter that includes a "J number." The applicant must then provide the J number to the Building Division to obtain a Demolition Permit.

Jason Garrison, County of Alameda General Services Agency

Jason Garrison is an Environmental Project Manager with the County of Alameda General Services Agency, which is involved in ensuring that construction and renovation of County owned buildings do not pose a threat to worker and occupant health and safety. Buildings include a variety of types owned and operated by County including administrative offices, maintenance facilities, court houses, and police and fire facilities. The agency provides oversight and management to ensure compliance with environmental and OSHA health and safety requirements and, as the agency is responsible for county owned public buildings only, it is a "self-permitting" agency. The following indicates the questions and answers provided by Mr. Garrison.

Question 1: What permitting and other requirements does your agency require for builders and contractors who plan to demolish or renovate commercial or industrial buildings that are expected to contain PCBs in the building materials? Please comment on the process, approvals, and inspections that are conducted and what departments are involved.

In response to Question 1, Jason preferred not to respond until there is more information that might become available about the upcoming EPA Rulemaking. He did express an opinion that the current EPA requirements for "removal upon discovery" of any bulk product containing PCBs in excess of 50 ppm should take into account the location, extent, and condition of the material and the human health and environmental risk in selecting the appropriate abatement action (including management in-place). Jason did emphasize that most requirements for asbestos and lead are driven by health and safety considerations, whereas PCBs pose health and safety as well as an environmental concerns and requirements for PCBs will need to reflect this additional concern.

Question 2: For comparison purposes, could you comment on similar requirements where asbestos or lead may be contained in the buildings?

In response to Question 2, Jason indicated that the following steps are usually taken by the agency when abating asbestos: supplemental sampling for asbestos following EPA protocols for specific types of asbestos and areas within the buildings; hiring of an environmental consultant and certified abatement contractor to oversee and conduct the abatement activities; monitoring of indoor air to ensure that abatement is not posing a threat to the health and safety of workers and inhabitants; and proper transport and disposal.

Question 3: Does your agency maintain a building database that includes information (such as location, age, owner, and current and past usage of building) that could help determine if it may contain PCBs in building materials?

In response to Question 3, Jason indicated that the Agency conducted an asbestos survey of all county buildings in the late 1990s and found that most buildings contained asbestos in various forms including roofing, floor tiles, sheet rock, concrete, and pipe insulation. Jason indicated that Alameda County does maintain a centralized asbestos survey database for County buildings.

Chuck Bove, Consultant with Vista Environmental, LLC

Chuck Bove is a principal with Vista Environmental, LLC and has 22 years of experience in the Bay Area working on toxic substances remediation associated with building demolition and renovation. The role of the environmental consultant in building demolition and renovation is to assist the owner/developer in understanding and complying with the regulatory requirements governing management of toxic substances, including PCBs, asbestos, and lead. Typical assignments consist of conducting surveys and assessing the extent of contamination associated with a building or building footprint (that may extend beyond the building perimeter), developing remedial action work plans (see Geoffrey Blair interview on same topic) that would go out to bid to abatement contractors, and oversight of abatement contractors to ensure compliance with the regulations.

Chuck has worked for a number of Bay Area municipalities and indicated that compliance with regulations tends to be fairly good for industrial and commercial buildings, but fairly poor for individual homes. The best overall compliance is with those municipal agencies that have a permit requirement for testing prior to demolition or renovation. Such requirements are often part of the building permitting process. For asbestos, the abatement contractor must apply for and receive a "J number" from the Bay Area Air Quality Management District (BAAQMD) that is assigned to that specific abatement project and in turn provide that "J number" to the municipal permitting agency. He noted that there is a real need for better education of general contractors so that they can better understand these requirements and their roles in complying with the requirements.

With respect to PCBs, Chuck indicated that most clients are reluctant to voluntarily survey building materials for PCBs because of the potential unknown cost of abatement. Chuck also explained that windows containing caulk that contains greater than 1% of asbestos is required to be wrapped or boxed up and disposed of in a Class 2 landfill and in many cases this same caulk

may contain PCBs. He indicated that fluid leaks from fluorescent bulb ballasts are mitigated but most contractors and owners are not aware that the fluid may contain PCBs. Chuck indicated that up to 30 percent of the existing inventory of ballasts for fluorescent bulbs may contain PCBs and although most ballasts are now managed properly, the ballasts may have leaked PCB fluid onto the light fixture, which is not addressed.

Chuck also indicated that cutoff dates for hazardous materials (such as 1980 for asbestos) may be misleading given that imported building materials may still contain hazardous materials such as asbestos or lead.

Research Question #3

The third research question focused on the types and ages of buildings where PCBs are likely to have been used in the Bay Area, and to what extent existing building inventory databases can be used to address this question.

Previous research conducted by a team of consultants in support of the SFEP Project recommended that the "Grant Project focus its efforts on buildings constructed or substantially remodeled between 1957 and 1977." (Moran et al, 2007). Although PCBs were generally available for use in buildings from 1950 through 1978, research conducted in Switzerland indicated that the number of joint sealants tested and found to have concentrations of PCBs in excess of 10 g/kg were highest in those buildings constructed between 1955 and 1977 (Kohler et al, 2005). More recent studies have found PCBs in 14% to 42% of tested buildings, with higher frequencies in commercial and institutional buildings (Robson et al., 2010). PCBs have been found in buildings dating back to 1950. Limited data exist for pre-1945 structures, which might have been remodeled with PCB caulk; of eight buildings tested, none had PCB caulk (Robson et al., 2010). Most North American locations tested are commercial and institutional buildings or other infrastructure (e.g., parking garages). PCB caulk has rarely been found in residential buildings; it is unclear whether this relates to the limited number of residential buildings that have been tested, residential construction methods, or the typically higher residential building renovation frequencies). On the basis of available data, EPA recommends that building owners test caulk in buildings constructed between 1950 and 1978 for PCBs (EPA, 2009).

Moran et al (2007) note that available information in the literature suggests that common uses of PCB-containing caulking and sealants were around windows, at building/walkway interfaces, and in expansion joints. More recent investigations similarly found PCBs in caulk in outdoor seams

between concrete or masonry blocks and in elastic sealants around windows and door frames (Robson et al., 2010). While windows and doors appear in all construction types, caulked expansion joints are most commonly designed into concrete and masonry structures. Most of the structures evaluated in previous studies of PCB-containing caulk were of these construction types.

Several of the interviewees were asked about the availability of building databases that could potentially be used to characterize buildings in terms of potential for containing PCBs. For example, the City of San Jose has a building parcel inventory that contains information on which permits have been applied for (which could indicate the age of structures), what CEQA clearances have been issued, and other parcel-specific information. Similarly, the City of San Mateo maintains a database with similar information. These data can be accessed at the time of an individual permit application, but are not readily aggregated. Estimating the number of buildings that were constructed or remodeled when PCB-containing caulk was used would require a parcel by parcel analysis and interpretation. Susan Klosterhaus, the San Francisco Estuary Institute (SFEI) project manager for the sampling portion of the PCBs in Caulk Project, indicated that SFEI was also not aware of the existence of any databases containing this type of information in an aggregated form. Arleen Feng, a stormwater program representative on the PCBs In Caulk Project Team, noted that HazUS, a FEMA mapping tool, uses proprietary insurance information to map various occupancy classes among different building types within a census tract, but all data are expressed as square footage, not number of structures (e-mail to Peter Mangarella, 2/23/10)

Guidance for field identification of the types of buildings constructed during this period may be available from a number of architectural and other sources, including a FEMA document titled “Rapid Visual Screening of Buildings for Potential Seismic Hazards” (FEMA, 2002). Appendix D of this document illustrates photos of various buildings (including a number of buildings in the Bay Area) that show how architectural styles and building materials can be used to indicate the approximate period when the building was constructed.

SUMMARY OF FINDINGS

The following summarizes the key findings of this research:

- PCBs in building materials and the potential for release into the environment during building demolition or renovation is an emerging issue that local agencies are not necessarily aware of or have adequate means of regulating.
- No Federal, state, or local requirement to test caulk for PCBs was identified. Existing practices for building demolition and renovations appear to be assuming that caulk is PCB-free.
- The perspective of managing toxic chemicals in buildings undergoing demolition or renovation is often that of health and safety to workers and inhabitants as dictated by OSHA requirements. The concept of managing a chemical such as PCBs, where an important pathway is exposure to rainfall and runoff, is new and will require education.
- The management of PCBs in building materials can take advantage of the process established for and the experience gained from asbestos management programs, especially with respect to requiring testing for PCBs as part of the demolition/renovation permitting process prior to demolition/renovation.
- Building inventory databases that contain the information (e.g., permit information that can be used to identify the age and past major remodeling of individual buildings) needed to characterize potential for containing PCB caulk likely exist in many Bay Area municipalities. However, because these databases are not designed to allow aggregation of relevant data, estimating the number of buildings that were constructed or remodeled when PCB-containing caulk was used could be very resource intensive.

REFERENCES

Kohler, M. J. Tremp, M. Zennegg, C. Seiler, S Minder-Kohler, M. Beck, P. Lienemann, L. Wegman, P. Schmid, 2005. Joint Sealants: An Overlooked Diffuse Source of Polychlorinated Biphenyl's in Buildings, *Environ. Sci. Technol*. **39**(7): 1967-1973.

Moran, K. S. Klosterhaus, L. McKee, J. Davis, B. Elzufon, K. Lundberg, P. Salop, 2007. Memorandum dated July 16, 2007 to Arleen Feng, CEP Project Coordinator titled "First Phase Support Information for PCB Portion of Taking Action for Clean Water Grant".

FEMA, 2002. Rapid Visual Screening of Buildings for Potential Seismic Hazards, FEMA 154, Edition 2, March 2002 prepared to support National Earthquake Hazards Reduction Program (NEHRP).

EPA, 2009. Preventing Exposure to PCBs in Caulking Material. Prepared by EPA Office of Pollution Prevention and Toxics. EPA-747-F-09-005. September 2009.

Robson, M., L. Melymuk, et al. 201). "Continuing sources of PCBs: the significance of building sealants." *Environment International* **36**(6): 506-13.