MEMORANDUM

TO: BASMAA Board of Directors

FROM: BASMAA Project Team: EOA, Inc., Larry Walker Associates, Geosyntec Consultants, Stephanie Hughes, and David J. Powers & Associates, Inc.

DATE: August 8, 2018

SUBJECT: Conceptual Approach to Developing an Assessment Methodology and Data Collection Program for Estimating Reductions in PCBs Loads to MS4s - Managing PCBs–Containing Building Materials during Demolition: Guidance, Tools, Outreach and Training

This technical memorandum is the deliverable for Task 7 (Conceptual Approach to Developing Assessment Methodology and Data Collection Program) of the Bay Area Stormwater Management Agencies Association (BASMAA) project *Managing PCBs–Containing Building Materials during Demolition: Guidance, Tools, Outreach and Training*. BASMAA developed guidance, tools, and outreach and training materials to assist with San Francisco Bay Area municipal agencies' efforts to address the requirements of Provision C.12.f. of the Bay Area Municipal Regional Stormwater Permit (SFBRWQCB 2015, referred to as the MRP). The MRP is issued by the San Francisco Bay Regional Water Quality Control Board[1] (Regional Water Board). Provision C.12.f requires Permittees to manage PCBs–containing building materials during demolition.

OBJECTIVES OF THIS TECHNICAL MEMORANDUM

Task 7 addresses MRP Provision C.12.f.ii (3), which requires that Permittees develop an assessment methodology and data collection program to quantify, in a technically sound manner, reductions in PCBs loads to municipal separate storm sewers systems (MS4s) through implementation of a new program for controlling PCBs during demolition of applicable structures. In future years, the assessment methodology and data collection program may be used to develop estimates of PCBs loads reduced through demolition management that inform efforts to demonstrate progress toward attaining wasteload allocations outlined in the San Francisco Bay PCBs Total Maximum Daily Load (TMDL) (SFBRWQCB 2008).

This memorandum summarizes existing information related to quantifying the potential reduction in PCBs loads to the MS4 that could be achieved through management of PCBs–containing building materials during demolition. It then provides a conceptual approach for developing the assessment methodology and data collection program using (1) existing data and information (e.g., from the literature, technical reports, and the MRP Fact Sheet), (2) information developed as part of other tasks for this project (e.g., the list of priority building materials identified in Task 1), and (3) data anticipated to become available as a new program to manage PCBs–containing materials during building demolition goes into effect on July 1, 2019. The approach does not call for new field monitoring efforts (often referred to as "special studies") by Permittees or their countywide stormwater management programs.

[1] The MRP was reissued November 19, 2015, with an effective date of January 1, 2016. There are 77 Phase I municipal stormwater Permittees in five Bay Area counties, which are among the over 90 local agencies represented by BASMAA.

Instead, it will rely on existing available data and new data collected by local agencies and project proponents as part of implementation of the new program for controlling PCBs during demolition.

EXISTING INFORMATION REGARDING RELEASE OF PCBs TO MS4s DUE TO DEMOLITION

To–date, there have been limited attempts to quantify the potential reductions in PCBs loads to MS4s that could be achieved through management of PCBs–containing building materials during demolition. The following sections summarize readily available related information (e.g., per building or overall Bay Area PCBs loads to MS4s due to demolition/renovation, and potential reductions in PCBs loads that could be achieved through demolition controls). The sources of this information were limited to literature, reports, and other documents that the project team already had – conducting a new literature search was beyond the scope of this project.

Larry Walker Associates et al. (2006)

LWA et al. (2006) estimated the mass of PCBs released to Bay Area stormwater runoff through demolition and renovation using estimates of the number of buildings demolished and the mass of PCBs released to water per demolished building. The LWA study cited a European study that described levels of PCBs in different waste streams generated during demolition of a 7–story building. Best Management Practices (BMPs) were employed during the demolition to minimize releases of PCBs. Approximately 2.5 grams of PCBs were estimated to be lost to soil and 2 to 20 grams lost to water (this presumably refers to wash waters). By scaling national data based on population, the LWA study estimated that 1,070 buildings are demolished in the Bay Area annually. It was then assumed that 10% of the demolished buildings (107 buildings/year) were built, repainted or re–caulked from 1950 to 1975, and therefore contained comparable levels of PCBs to the 7–story European building, which was presumably built during that timeframe. Under the assumption that building demolition in the United States would be unlikely to employ BMPs targeting the release of PCBs, the high end of the range estimated for discharge to water (i.e., 20 grams/building) was selected and multiplied by 107 buildings per year to produce an estimate of 2 kg/year PCBs released to Bay Area stormwater runoff through demolition. This estimate was then doubled to account for building remodeling and maintenance, resulting in an estimate of 4 kg/year PCBs released to stormwater runoff in the Bay Area through demolition and renovation.

Mangarella et al. (2010)

Mangarella et al. (2010) estimated a range of load reductions per year associated with building demolition in the Bay Area. LWA (2006) was cited for two of the assumptions used: (1) approximately 1,070 buildings are demolished per year in San Francisco Bay Area, 10% of which were built during the period when PCBs were most prevalent in building materials, and (2) for each demolished building potentially containing PCBs, a range of 2 to 20 grams of PCBs is released to surface waters. It was also assumed that 40 to 80% of the demolished buildings would be subject to hazardous waste controls, and the assumed controls vary in effectiveness from 50 to 80%. The projected PCBs load reduction due to these building demolition controls ranged from a low estimate of 0.1 kg/year to a high estimate of 3 kg/year.

SFEI Study (2011)

A study conducted by the San Francisco Estuary Institute (SFEI) included estimating the mass of PCBs in caulks in Bay Area buildings and releases to stormwater runoff during renovation and demolition (Klosterhaus et al. 2011), as described in the following four sections.

PCBs in Caulk in San Francisco Bay Area Buildings

Using a blind sampling approach, the SFEI study collected 25 caulk samples from the exterior of ten commercial and industrial buildings constructed in the study area between 1950 and 1980. The study area was the portion of the San Francisco Bay Area covered by the MRP: Alameda, Contra Costa, Santa Clara, and San Mateo Counties, and the cities of Fairfield, Suisun, and Vallejo. The caulk samples were analyzed for PCBs, which were detected in 88% of the samples, with 40% exceeding 50 ppm, the concentration at which caulk falls under U.S. Environmental Protection Agency (USEPA) regulations (Federal Register 2010). Detectable PCBs concentrations ranged over six orders of magnitude, from 1 to 220,000 ppm. These data were consistent with previous studies in other cities (Klosterhaus et al. 2011).

PCBs Mass in Caulk in Study Area Buildings

A geographic information system (GIS)–based approach was then used to estimate the number, area, and volume of currently standing buildings in the study area that were built during the era of greatest PCBs use in caulk. The approach used historical imagery and contemporary land use and involved characterization of randomly selected buildings within the study area, with the result scaled up to extrapolate total building counts and areas in the MRP footprint. Various assumptions, including the frequency of anticipated PCBs detection and PCBs concentrations in the caulk, average mass of caulk per unit building volume, and average building volume, were then applied to calculate an estimate of the total PCBs mass in building caulk in the study area. The evaluation resulted in a mid–range estimate of 10,500 kg PCBs in caulk in buildings located in the study area (low and high estimates were 767 and 46,000 kg, respectively), which equated to an average of 4.7 kg PCBs per building (low and high estimates were 0.6 and 16 kg per building, respectively). The estimate included caulk located on both the interior and exterior of buildings (Klosterhaus et al. 2011).

PCBs Loading to Stormwater Runoff from Building Renovation and Demolition

The SFEI study also developed an estimate of the PCBs mass released to the environment (and presumably stormwater runoff) during the renovation and demolition of buildings with PCBs–containing caulk. The estimate was developed in a spreadsheet model that involved estimating the number of study area buildings demolished and renovated, the mass of PCBs per building, and the percent of the PCBs mass released to the environment per building. It was assumed that all PCBs released to the environment enter stormwater runoff. The estimate considered releases due to current renovation and demolition practices only (i.e., without BMPs for specifically managing PCBs in building materials). As with the other studies summarized in this memorandum, the estimate did not include releases from intact building caulk (e.g., PCBs losses via volatilization, erosion of in–use caulk, or leaching via precipitation). The SFEI estimate also explicitly did not include residues left on the ground or exposed to environmental transport process post–demolition or renovation. The result was a mid–range estimate of PCBs mass released from caulk to stormwater runoff during building demolition and renovation activities in the San Francisco Bay study area of 0.04 kg/year, with about 50% of the total PCBs mass released during renovations and 50% during demolitions. The authors noted that there is considerable uncertainty in this estimate and it is likely an underestimate because PCBs losses from caulk scraps that may be left behind at a demolition or renovation site were not included (Klosterhaus et al. 2011).

It is also important to note that the SFEI study used results from a study in Sweden (Jansson et al. 2000) as a proxy to estimate PCBs losses to the environment during building renovation and demolition. The Swedish study examined a remediation site where PCBs–containing caulking was removed from a

building and replaced with caulking that did not contain PCBs; however, the building was not demolished. The Swedish study evaluated PCBs losses to the environment (water, soil and air) during decontamination procedures specifically designed to remove residual PCBs after the caulk had been removed (i.e., grinding and power washing the concrete or masonry substrate formerly in contact with the caulk). It seems likely that the SFEI study's use of this decontamination procedure as a proxy for building renovation and demolition could significantly underestimate releases of PCBs during the latter processes, contributing to the overall low bias of the 0.04 kg/year estimate.

Recommendations for Refining Estimates

The SFEI study recognized the high uncertainty in the above estimates of the mass of PCBs in caulks in Bay Area buildings and releases to stormwater runoff during renovation and demolition. Several tasks were therefore recommended to gather more robust San Francisco Bay Area–specific data (Klosterhaus et al. 2011). To refine the estimate of the mass of PCBs in caulk in the San Francisco Bay area buildings, the SFEI study recommended validating:

- The estimated number of buildings constructed during the period when PCBs were used in caulk;
- The estimated PCBs concentration distribution in buildings constructed during the period when PCBs were used in caulk, including by building land use (e.g., residential, industrial, or commercial) and by location within a building (e.g., between concrete blocks, around windows); and
- The estimated average mass of PCBs in caulk in relation to building volume.

To refine the estimate of PCBs release to stormwater runoff from caulk during building renovation and demolition, the SFEI study recommended:

- Validating estimates of the annual number of demolitions and renovations in the Bay Area by building type and construction year;
- Validating the estimated mass of PCBs associated with caulk that is released during renovation and demolition (e.g., perform pilot studies of actual building demolitions and renovations in which PCBs releases to the environment are quantified); and
- Conducting a study to evaluate the mass of PCBs associated with caulk scraps that may be left behind at a demolition/renovation site.

BASMAA Integrated Monitoring Report (2014)

In its Integrated Monitoring Report (IMR), BASMAA (2014) used a mass balance approach to calculate preliminary rough estimates of ranges of the potential baseline mass of PCBs released per building to MS4s during demolition or renovation. These ranges were designated "baseline" under the assumption that new controls were not implemented specifically to manage PCBs in building materials during demolition or renovation. The calculations accounted for ranges of PCBs mass in each building and the assumed effectiveness of offsite disposal and erosion and sediment controls. The following assumptions were used:

- Range of mass – 0.6 to 16 kg PCBs per building, based on Klosterhaus et al. (2011)
- Effectiveness of offsite disposal – 70 to 90% (the IMR states this range is based mostly on best professional judgment)

- Effectiveness of erosion and sediment controls – 60 to 80% (the IMR states this range is based mostly on best professional judgment)

The result of the calculations ranged from 0.012 to 1.92 kg PCBs released per building during demolition or renovation, in the absence of controls implemented specifically to manage PCBs in building materials during demolition or renovation.

MRP Fact Sheet (2015)

The MRP Fact Sheet (SFBRWQCB 2015) describes a simple equation with four terms that estimates the loading of PCBs in building materials to MS4s that could be avoided by implementing demolition control measures per MRP Provision C.12.f. The Fact Sheet notes that each of the terms could be represented by a range of values and information is limited on the value of each term (particularly the average fraction of PCBs entering the MS4 due to demolition without controls). Table 1 shows the four terms and the assumed values. The Fact Sheet states that the assumed values for each term were derived from information in Klosterhaus et al. (2011), though the derivation of the values used for terms 3 and 4 is unclear.

Table 1. Terms in MRP Fact Sheet (SFBRWQCB 2015) equation used to estimate the loading of PCBs in building materials to MS4s that could be avoided by implementing demolition control measures.

Term	Value	Units
1. Number of applicable structures[1] demolished per year	50	buildings/year
2. Average mass of PCBs per applicable structure[1]	5	kg
3. Average fraction of PCBs that enters MS4s due to demolition without controls[2]	0.01	dimensionless fraction
4. Average fraction of PCBs prevented by controls[2] from entering MS4	0.8	dimensionless fraction

[1]Applicable structures are defined as buildings constructed from 1950 through 1980 with PCBs concentration in caulks/sealants greater than 50 ppm, excluding single family residential and wood frame buildings.

[2]The term "controls" presumably refers to the proposed new demolition management program, not existing construction controls.

Multiplying the four terms together results in an estimated 2 kg PCBs/year loading prevented from entering MS4s by controlling PCBs during demolition (Equation 1):

Equation 1. *Estimated load avoided = 50 buildings/year X 5 kg PCBs/building X 0.01 X 0.8 = 2 kg PCBs/year*

DEVELOPING A REFINED METHODOLOGY AND DATA COLLECTION PROGRAM

All of the methodologies described above use a similar framework to quantify PCBs loads to MS4s due to demolition and/or potential reductions in PCBs loads that could be achieved through demolition

controls. In general the parameters used include the number of buildings demolished per year, the mass of PCBs in the buildings, the fraction of the PCBs mass potentially released to the MS4, and the assumed effectiveness of controls. All of the studies recognize the significant uncertainty in the values or ranges that were selected for each of the various parameters. Thus the approach presented in the remainder of this technical memorandum to refining these methodologies is to retain the basic framework and focus on refining the parameter values. The following sections present a conceptual approach for refining and reducing uncertainty in the values of each of the four terms (Table 1) in the above–described equation from the MRP Fact Sheet (SFBRWQCB 2015). Equation 1 can then be applied using the refined parameters, which should represent the best available Bay Area regional estimates at the time of the calculation.

MRP Provision C.12.f.i includes a definition of "applicable structures," the subset of existing structures where a protocol for managing PCBs during demolition must be implemented. Applicable structures are defined as "at a minimum, commercial, public, institutional and industrial structures constructed or remodeled between the years 1950 and 1980 with building materials with PCBs concentrations of 50 ppm or greater. Single–family residential and wood frame structures are exempt." Relevant information that should be collected by BASMAA and/or the Bay Area countywide stormwater management programs once MRP Permittees implement the new programs to manage PCBs during demolition includes:

- The number of applicable structures demolished each year.
- The estimated mass of PCBs in priority building materials in each applicable structure, calculated by multiplying the mass of the priority material in the building by the PCBs concentration in that material.

Further details are provided in the below sections. BASMAA and/or the Bay Area countywide stormwater management programs will compile, evaluate, and report (as part of their MRP Annual Reports) these data. This will require development of a data management system to manage and analyze these data on a regional basis (e.g., via a BASMAA regional project).

The conceptual process to refine the value of each term of Equation 1 is outlined below along with the associated data collection needs. Refining the terms in Equation 1 will also help to address some of the recommendations in the Klosterhaus et al. (2011) study that were summarized earlier.

Term No. 1 – Number of Applicable Structures Demolished per Year

Background

LWA et al. (2006) estimated that 1,070 buildings are demolished in the Bay Area annually by scaling national data based on population. It was then assumed that 10% of the demolished buildings (107 buildings/year) were built, repainted or re–caulked from 1950 to 1975.

The SFEI study reported a medium estimate of 521 building demolitions per year in commercial and industrial land uses in the study area, based on Bay Area Air Quality Management District (BAAQMD) asbestos abatement permitting data.[2] The SFEI study also reported the following medium estimates:

[2] The BAAQMD regulations require that a "J Number" be applied for and obtained before applying for a building permit for demolition of an existing structure or renovations removing greater than 100 square feet of asbestos material within the San Francisco Bay air basin.

46% of the demolished buildings were built between 1950 and 1980 and 36% had PCBs concentration in caulks/sealants greater than 50 ppm (Klosterhaus et al. 2011). Multiplying (521) x (0.46) x (0.36) results in an estimated 86 commercial and industrial buildings demolished per year that were built between 1950 and 1980 and had PCBs concentration in caulks/sealants greater than 50 ppm.

Based upon information in the SFEI study, and considering that the scope of the Program is limited to exclude wood frame buildings, the MRP Fact Sheet assumed 50 applicable structures are demolished per year in the Bay Area (SFBRWQCB 2015).

Conceptual Process for Refinement

As part of the new programs to manage PCBs–containing materials during building demolition, which are required to go into effect as of July 1, 2019, demolition permit applicants will be informed that their project is subject to the MRP Provision C.12.f requirements, necessitating an initial screening for priority PCBs–containing materials. The screening will require that applicants fill out a form with data that will determine whether or not the building was an applicable structure. Permittees should require that applicants submit a copy of these forms to BASMAA and/or the Bay Area countywide stormwater management programs. This will provide BASMAA and/or the Bay Area countywide stormwater management programs with the information needed to determine the number of applicable structures demolished each year, and compile and report this information.

Term No. 2 – Average Mass of PCBs per Applicable Structure

Background

As described previously, the SFEI study used a GIS–based approach to estimate the number, area, and volume of currently standing buildings in the study area that were built during the era of greatest PCBs use in caulk. Various assumptions, including the frequency of anticipated PCBs detection, PCBs concentrations in caulk, average mass of caulk per unit building volume, and average building volume, were then applied to calculate an estimate of the total PCBs mass in building caulk in the study area. The evaluation resulted in a mid–range estimate of 10,500 kg PCBs in caulk in buildings located in the study area (low and high estimates were 767 and 46,000 kg, respectively), which equated to an average of 4.7 kg PCBs per building (low and high estimates were 0.6 and 16 kg per building, respectively). The estimate included caulk located on both the interior and exterior of buildings (Klosterhaus et al. 2011). Based upon the information in the SFEI study, the MRP Fact Sheet assumed an average applicable structure in the Bay Area contains 5 kg of PCBs (SFBRWQCB 2015).

Conceptual Process for Refinement

Tasks 1 and 3 of this BASMAA regional project identified five priority materials to be assessed for in applicable structures before demolition, as part of the initial screening for priority PCBs–containing materials. Demolition project applicants should be required to characterize the concentrations of PCBs in each of the five priority building materials (if present), using either existing information specific to the building or the pre–demolition building assessment protocol developed via Task 3 of this BASMAA regional project (BASMAA 2018). When the PCBs concentration is ≥ 50 ppm, applicants should also be required to report the estimated amount of each priority material in the applicable structure in either linear feet (for caulking or rubber window gaskets) or square feet (for mastics/adhesives or insulation). Thus the screening process should require that for applicable structures, applicants fill out a form with the PCBs concentration in each priority material and, when the PCBs concentration is ≥ 50 ppm, the

estimated amount of that material. Permittees should require that applicants submit a copy of these forms to BASMAA and/or the Bay Area countywide stormwater management programs.

The mass of each priority material in each applicable structure will then be calculated (e.g., via a BASMAA regional project) by multiplying the mass of each priority material in the building by the PCBs concentration in that material. This calculation will require developing conversion factors (e.g., via a BASMAA regional project) that provide the estimated mass of material per linear foot (i.e., for caulking or rubber window gaskets) or square foot (i.e., for mastics/adhesives or insulation). An estimated average mass of PCBs per applicable structure should then be calculated (e.g., via a BASMAA regional project).

It should also be noted that if there are areas with buildings with a relatively high mass of PCBs compared to the regional average, Permittees should have the flexibility to apply Equation 1 at the site, Permittee, or county scale, rather than the regional scale, using local data for Term 2, if sufficient local data are available to support that approach. This would potentially allow Permittees to claim a higher loads avoided credit for that area. Higher overall masses of PCBs per building could result from higher than usual concentrations of PCBs in building materials, a greater amount of PCBs–containing building materials than usual, or a combination of the two. Local cities or counties that use the data from the assessment methodology and data collection program to demonstrate relatively high masses of PCBs in demolished buildings would potentially be able to claim greater PCBs load reductions in their annual reports using Equation 1, with local data used to calculate the value for Term 2. The specific circumstances under which this approach would be applicable would need to be better defined during future MRP reissuances.

Term No. 3 – Average Fraction of PCBs that Enters MS4s Due to Demolition without Controls

Background

The fate and transport of PCBs in building materials during and after demolition is a complex process that is not well documented or understood given the complex physicochemical properties of PCBs congeners, the varied behavior of building materials during demolition, and the various potential endpoints (disposal, recycling, releases to the environment at the site or during disposal/recycling).

The LWA (2006) cited a European study that described levels of PCBs in different waste streams generated during demolition of a 7–story building. BMPs were employed during the demolition to minimize releases of PCBs. Approximately 2.5 grams of PCBs were estimated to be lost to soil and 2 to 20 grams lost to water.

The SFEI study developed an estimate of the PCBs mass released to the environment (and presumably stormwater runoff) during the renovation and demolition of buildings with PCBs–containing caulk. The estimate assumed that BMPs for specifically managing PCBs in building materials were not implemented. The mid–range estimate of PCBs mass released from caulk to stormwater runoff during building demolition and renovation activities in the San Francisco Bay study area was 0.04 kg/year, with about 50% of the total PCBs mass released during renovations and 50% during demolitions. The authors noted that this is likely an underestimate because PCBs losses from caulk scraps that may be left behind at a demolition or renovation site were not included (Klosterhaus et al. 2011). In addition, as noted earlier, it seems likely that the SFEI study's use of a decontamination procedure at a remediation site where PCBs–containing caulking was removed from a building (Jansson et al. 2000) as a proxy for

building renovation and demolition could significantly underestimate releases of PCBs during the latter processes, contributing to the overall low bias of the 0.04 kg/year estimate.

The MRP Fact Sheet (SFBRWQCB 2015) assumed that on average one percent of the mass of PCBs in applicable structures enters MS4s due to demolition without controls (the term "controls" appears to refer to the proposed new demolition management program, not existing construction controls).

The one percent value presumably incorporates losses to environment both at the site and during disposal and recycling. Conceptually, this approach assumes that without controls, the post–demolition transport and fate of the PCBs–containing materials that were in the demolished building fall within three general categories:

1. Released during the demolition (e.g., as part of an initially airborne plume of small particles) and settled in a "halo" around the site. Any wash waters used during the demolition (e.g., during cleaning of equipment, onsite or offsite) that are not fully contained and treated or disposed of could also transport PCBs–containing materials to the MS4.
2. Removed from the site and disposed of as part of the general waste stream (e.g., at a landfill), with some fraction potentially released to the environment during the handling, transport, and disposal process (e.g., during transportation of waste materials by truck to a landfill).
3. Removed from the site with recycled materials, with some fraction potentially released to the environment during the handling, transport, and recycling process (e.g., during transportation of waste materials by truck to a transfer station or recycling facility) or returned to the environment with recycled materials.

The Fact Sheet methodology assumes that all PCBs–containing materials released into the environment via any of the above three categories eventually enter the MS4. For example, permanent storage in onsite or offsite pervious areas is assumed to be negligible. All three transport and fate categories are presumably incorporated into the third term of Equation 1, the average fraction of PCBs that enters MS4s due to demolition without controls.

The Fact Sheet methodology also assumes that the effectiveness of any existing controls (e.g., proper offsite disposal of PCBs–containing materials, erosion and sediment controls, and other routine construction site controls) is incorporated into the third term of Equation 1.

Conceptual Process for Refinement

BASMAA and/or the Bay Area countywide stormwater management programs should conduct a literature and information review to search for any additional available data regarding PCBs release during demolition. This could include data from older studies that the project team is not currently aware of and/or data from any recent new studies.

One area that should be explored during the literature and information review is site remediation documentation submitted to the Regional Water Board, California Department of Toxic Substances Control (DTSC), or USEPA. Parties responsible for the remediation of sites with elevated levels of PCBs are often required, under the Resource Conservation and Recovery Act (RCRA) or the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Toxic Substances Control Act (TSCA), or California hazardous waste laws, to sample and analyze various materials or substrates across the site and downstream of the site. Remediation site work plans or site characterization reports may

include characterization of media (e.g., water, soils, sediments) impacted by a known PCBs source area (e.g., where PCBs-containing building materials are handled) and enters the MS4 at a downstream location, onsite or offsite. Characterization data that includes PCBs concentrations and other analytes that could potentially be used as a surrogate for PCBs may be most useful. The evaluation should focus on the subset of these remediation sites that may be most relevant in terms of the pollutants present and transport pathways to the MS4, such as metal shredding and concrete recycling operations.

Another area to explore during the literature and information review is whether disposal and/or recycling practices have improved in recent years such that less PCBs would be lost to the environment via these pathways. If so, MRP Permittees should attempt to quantify and take credit for the additional load avoided.

Term No. 4 – Average Fraction of PCBs Prevented by Controls from Entering MS4

Background

There is very limited information readily available on the effectiveness of controls to manage PCBs during building demolition. Sweden and Switzerland have programs for the management of PCBs–containing building materials, including caulk. Two studies in Sweden estimated that more than 99% of the PCBs contained in caulk were captured following the implementation of activities that specifically targeted the prevention of PCBs release to the environment. Most of the PCBs were captured via the removal of the caulk from the building through abatement–related activities. These activities included using high power vacuums during the grinding and cutting processes and power washing, which resulted in approximately 0.03% of the total PCB mass in the caulk entering stormwater runoff. PCBs were also released to the air, mainly as a result of the use of high temperature tools and/or heat generated during demolition or renovation activities (Sundahl et al. 1999; Jansson et al. 2000; Astebro et al. 2000).

The MRP Fact Sheet (SFBRWQCB 2015) assumed that demolition controls would be, on average, 80% effective at preventing PCBs from entering the MS4 (Equation 1). The term “controls” presumably refers to the proposed new demolition management program, not existing construction controls. The new program in the Bay Area will likely focus on removing caulk and other priority PCBs-containing building materials before demolitions. It seems reasonable that the overall assumed effectiveness of the anticipated Bay Area program (i.e., 80%) would be lower than that observed during the Swedish studies (greater than 99%) given the much larger scale of the Bay Area program and that all PCBs–containing materials are considered in the 80% estimate, not just caulk (i.e., initially, lower-priority PCBs–containing building materials will not necessarily be assessed for and removed in the Bay Area).

Conceptual Process for Refinement

BASMAA and/or the Bay Area countywide stormwater management programs should conduct a literature and information review to search for any additional available data regarding the effectiveness of controls to manage PCBs during building demolition. This could include data from older studies that the project team is not currently aware of and/or data from any recent new studies.

The new Bay Area demolition control program will not initially assess lower-priority PCBs–containing building materials before demolition. Instead, the initial focus will be on the five priority building materials identified in Task 1 of this BASMAA regional project, per the pre–demolition building assessment protocol developed via Task 3 of this project (BASMAA 2018). One concept that should be explored during the literature and information review is whether an approximate estimate could be

developed for the ratio of the average mass of PCBs in the five priority materials per building to the total average mass per building of PCBs in all of the PCBs–containing materials. This ratio would represent a rough estimate of the fraction of the total PCBs mass in the building removed by the new demolition control program and inform initial effectiveness estimates. This type of analysis might also help Permittees evaluate the cost-effectiveness of eventually including additional materials on the list of priority materials in the assessment protocol. If deemed cost-effective, these additional materials could be included in the protocol and targeted for removal if concentrations of PCBs exceed 50 ppm, which would achieve additional loads avoided.

NEXT STEPS

A conceptual approach is outlined above to assist Permittees with developing an assessment methodology and data collection program to quantify reductions in PCBs loads to MS4s through the new programs for controlling PCBs during demolition of applicable structures, which are required to go into effect as of July 1, 2019. In summary, Permittees will inform demolition permit applicants that their project is subject to the MRP Provision C.12.f requirements, necessitating an initial screening for priority PCBs–containing materials. The screening will require that applicants fill out a form with data that will determine whether or not the building was an applicable structure, and the estimated amount of each priority material in either linear feet (for caulking or rubber window gaskets) or square feet (for mastics/adhesives or insulation) in applicable structures. Permittees should require that applicants submit a copy of these completed forms to BASMAA and/or the Bay Area countywide stormwater management programs. This will provide BASMAA and/or the Bay Area countywide stormwater management programs with the information needed to determine the number of applicable structures demolished each year and the estimated mass of PCBs in priority building materials in each applicable structure, and compile and report these data (as part of MRP Annual Reports). In addition, BASMAA and/or the Bay Area countywide stormwater management programs should:

- Develop a process and regional data management system for collecting, compiling and evaluating the data generated by the new demolition control programs at the regional level.
- Conduct a literature and information review to search for any additional available data regarding (1) PCBs release to the environment during demolition and (2) the effectiveness of controls to manage PCBs during building demolition. The review should include exploring whether an approximate estimate can be developed for the ratio of the average mass of PCBs in the five priority materials per building to the total average mass of PCBs in all of the PCBs–containing materials per building. Another area to explore is whether disposal and/or recycling practices have improved in recent years such that less PCBs would be lost to the environment via these pathways. Finally, the review should also explore PCBs concentration data from storm drains sediment and soil samples collected from some demolition project sites with EPA involvement (however, EPA has noted that these PCBs concentration data in soils and in storm drain inlets or catch basins are extremely variable and very site-specific).

It is anticipated that Permittees will collect and evaluate the above data during the next permit term (i.e., “MRP 3.0”) and that the results may inform crediting PCBs load reductions from MS4s during the following permit term (i.e., “MRP 4.0”). It should also be noted that Permittee efforts to quantify reductions in PCBs loads to MS4s through the new programs for controlling PCBs during demolition will be conducted in the overall context of completing reasonable assurance analyses (RAAs). For example, RAA-related efforts will include an upcoming BASMAA regional project entitled “Refined Source Control Load Reduction Accounting for RAA.” This project will support revisions to the current Interim

Accounting Methodology for estimating load reductions from managing PCBs in building materials during demolition and other source control measures (e.g., source property identification and abatement, enhanced operations and maintenance).

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