PCBs in Building Materials

Cross Program Contaminant Working Group

November 1, 2023

Photo courtesy of Justine Warrington

PCB Symposium | PCBs in Building Materials

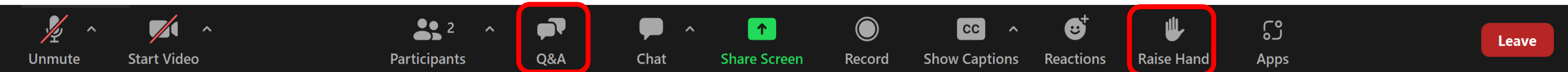
We'll officially start at 9 am PT/12 pm ET

Informal networking in the breakout rooms

1. Introduce yourself
2. Why did you sign-up for the PCB symposium and what are you excited to learn about today?

Navigating the workshop

- Update your name to include your pronouns and organization
- Message Marielle with any access needs
- Add questions to the Q&A or raise your hand and we'll unmute you



Agenda

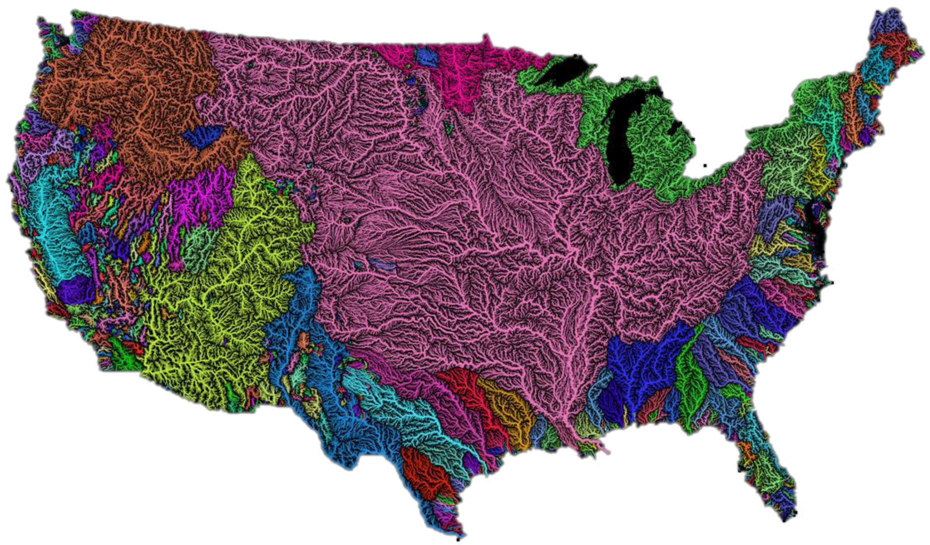
Time Pacific	Time Eastern	Topic
09:00 am	12:00 pm	**Introduction**
09:05 am	12:05 pm	**How to identify and address PCBs in building materials** Myles Perkins, Washington Department of Ecology
9:35 am	12:35 pm	**Managing PCBs in priority building materials** Reid Bogert, San Mateo County
10:05 am	1:05 pm	**Q&A**
10:30 am	1:30 pm	**Break**
10:40 am	1:40 pm	**PCBs in Building Materials** Keri Hornbuckle, Iowa Superfund Research Program
11:10 am	2:10 pm	**Managing PCBs in Vermont Schools** Patricia Coppolino, Vermont Agency of Natural Resources Sarah Owen, Vermont Department of Health
11:40 am	2:40 pm	**Q&A**
12:00 pm	3:00 pm	**Closing**

PCB Symposium

Cross Program Contaminant Working Group

BACKGROUND:

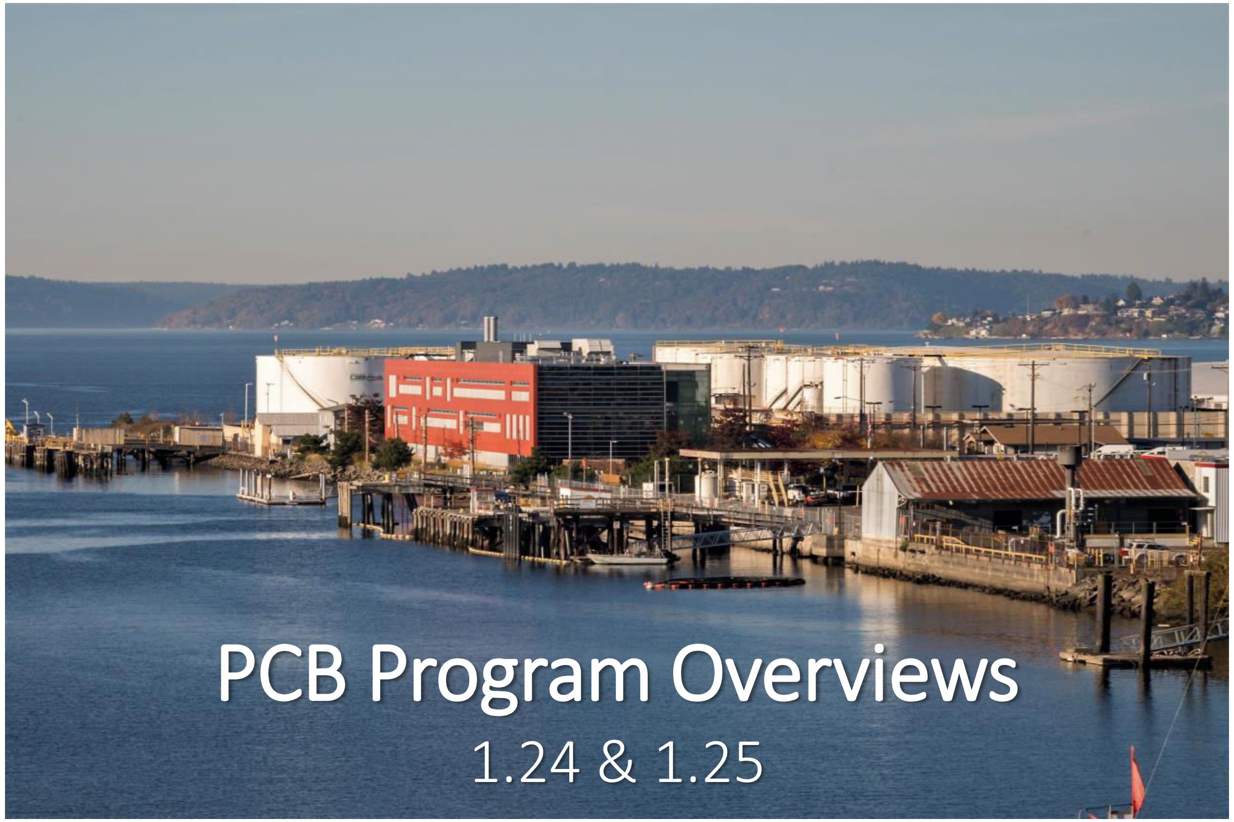
- Many estuaries (and river systems) are dealing with anthropogenic contaminants. Face similar challenges in this work.
- Share information on programs, projects, and best practices across regions to improve the effectiveness by which toxics contaminants are managed, controlled, and remediated.
- Initial focus on PCBs. Then poll those who are involved in contaminant management, and address the topics that are of interest

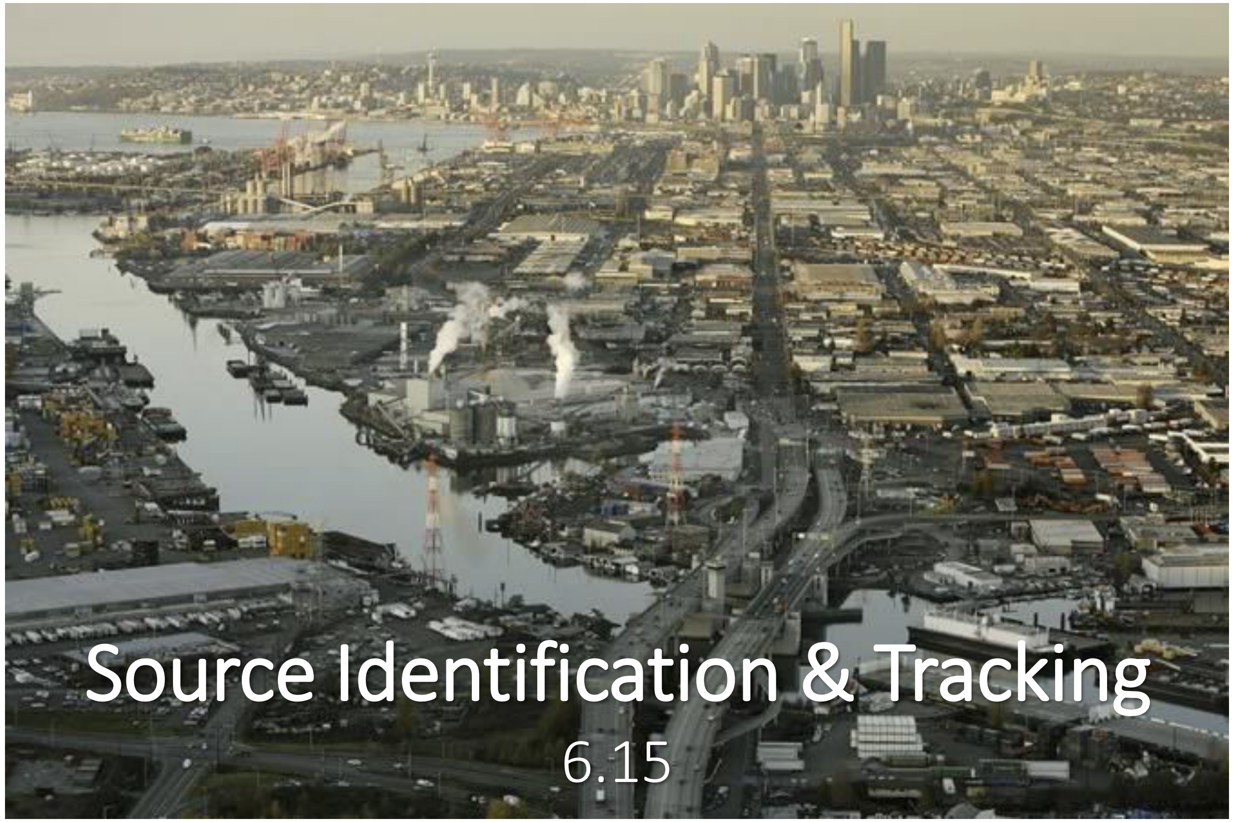


Map from Grasshopper Geography

PCB Symposium

Cross Program Contaminant Working Group





Learn More

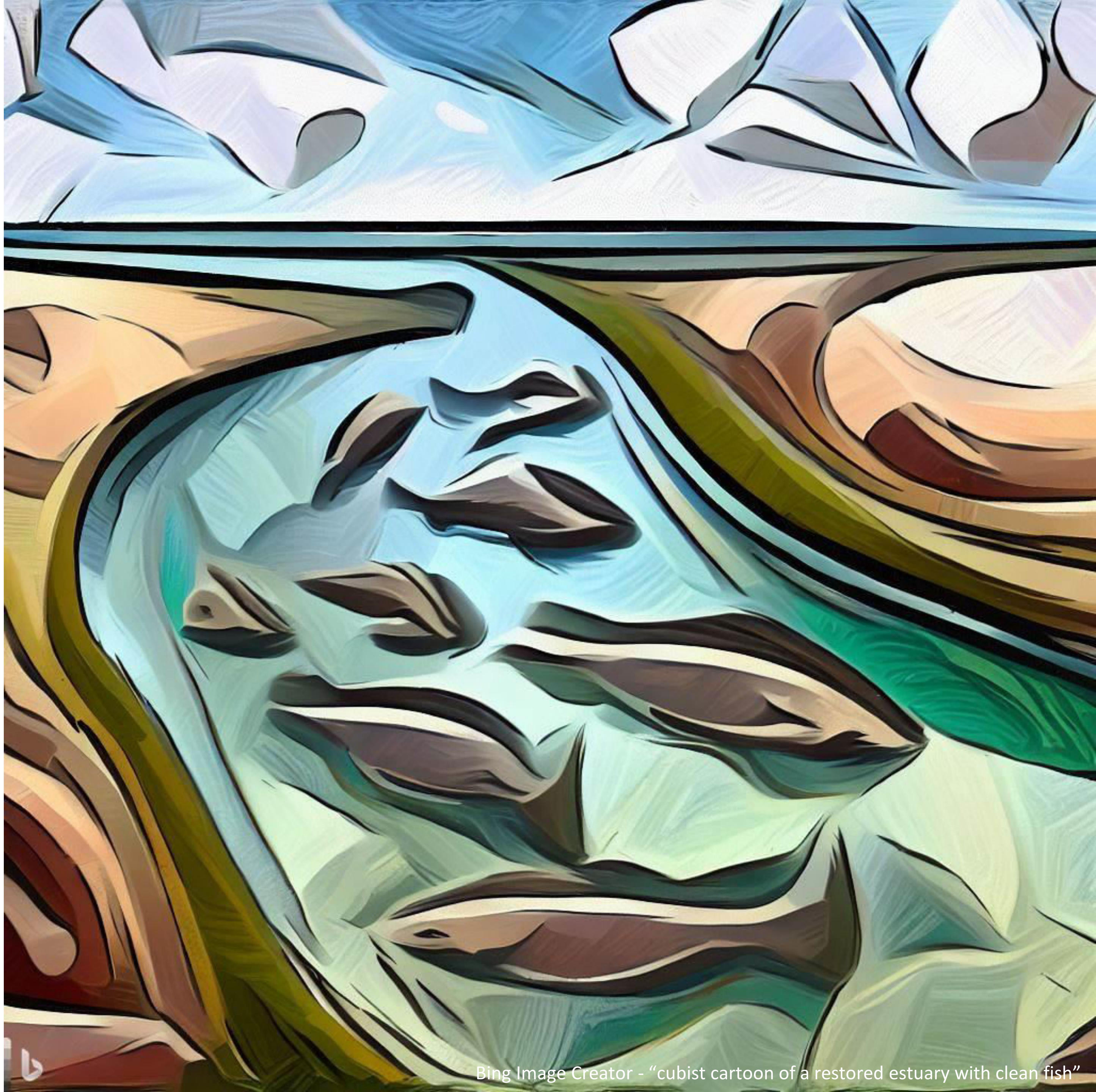
www.pugetsoundinstitute.org/about/cross-program-contaminant-working-group/

PCB Symposium
Cross Program Contaminant Working Group

Symposium Steering Committee

Andy James	jamesca@uw.edu
Greg Allen	allen.greg@epa.gov
Will Hobbs	whob461@ecy.wa.gov
Marielle Larson	marlars@uw.edu
Joel Baker	jebaker@uw.edu

pugetsoundinstitute.org/about/cross-program-contaminant-working-group/



Bing Image Creator - "cubist cartoon of a restored estuary with clean fish"

DEPARTMENT OF ECOLOGY
State of Washington

Finding and Addressing Sources of PCBs in Building Materials

PCB Symposium 2023

Myles Perkins

Agenda

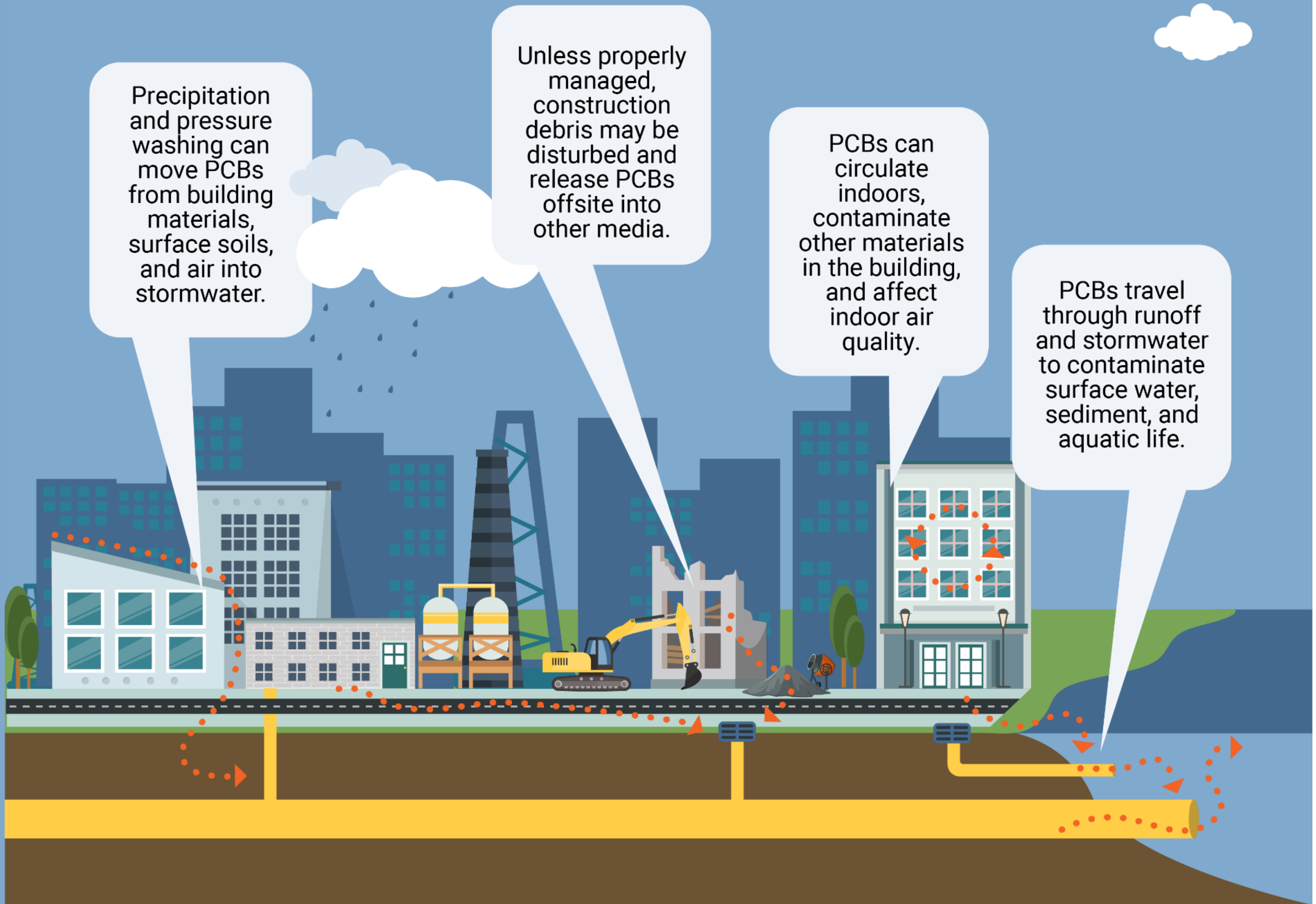
1. The Issue
2. What Did We Do?
3. Work To-Date
   - Early work
   - Guidance
   - How to estimate abatement projects
4. Proposed Next Steps

The Issue

- Buildings built between 1950–1979 may contain PCBs
- Although regulated under TSCA, source control is necessary to prevent impacts to waterbodies
- Little guidance that addresses exterior building materials

DEPARTMENT OF ECOLOGY
State of Washington

PCB CONTAMINATION PATHWAYS



DEPARTMENT OF ECOLOGY State of Washington

Regulatory Context

Remediation waste vs. **bulk product waste**

- PCB remediation waste due to **spills** or **releases** are cleaned up and disposed of under WA State MTCA
- PCB bulk product waste **derived from manufactured products** are disposed of under 40 CFR 761.62 (Toxic Substances Control Act—TSCA)
  - If it's greater than or equal to 50ppm, you must address once characterized
  - No good mechanism requiring owners to characterize before they abate or renovate their building materials
  - If characterized and source identified, could trigger further investigation

Regulatory Context (continued)

Water Quality

- Unlawful for any discharges to pollute state waters (RCW 90.48.080)

- Surface waters must be protected for their designated use, like recreation or aquatic life (WAC 173-201A)

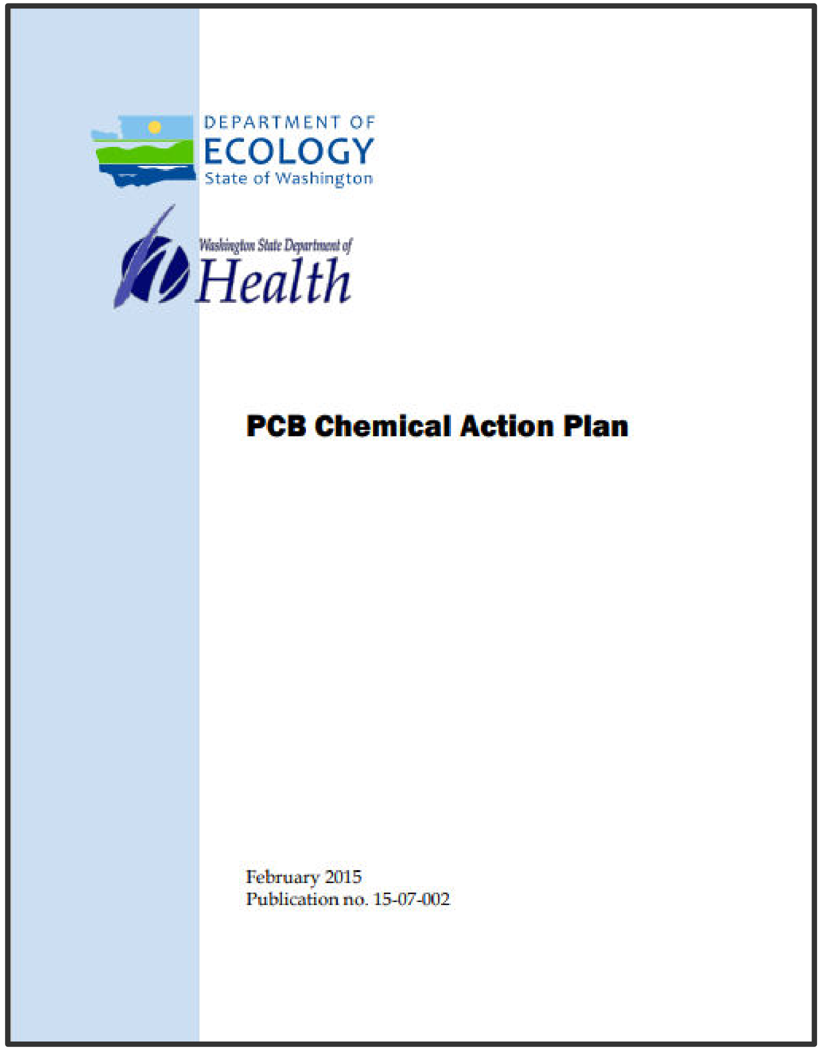
- NPDES permits, like Municipal Stormwater permits, do not authorize discharges that would cause a violation of water quality standards.

We Can Do More

- PCBs released into the environment via external building materials
  - Expect they're released in higher quantities during unmitigated demolition or renovation
- Must be managed before they're disturbed or added to landfill
  - Reduce leaching
  - Reduce impact on human health from fishing

What Did we Do?

- Awarded $373,000 by the Puget Sound Partnership in Fall 2020:
  - Pursue PCB Chemical Action Plan (CAP) recommendations
  - Establish PCBs in Buildings Taskforce
  - Work with EPA to promote awareness of issue


DEPARTMENT OF ECOLOGY State of Washington

Washington State Department of Health

PCB Chemical Action Plan

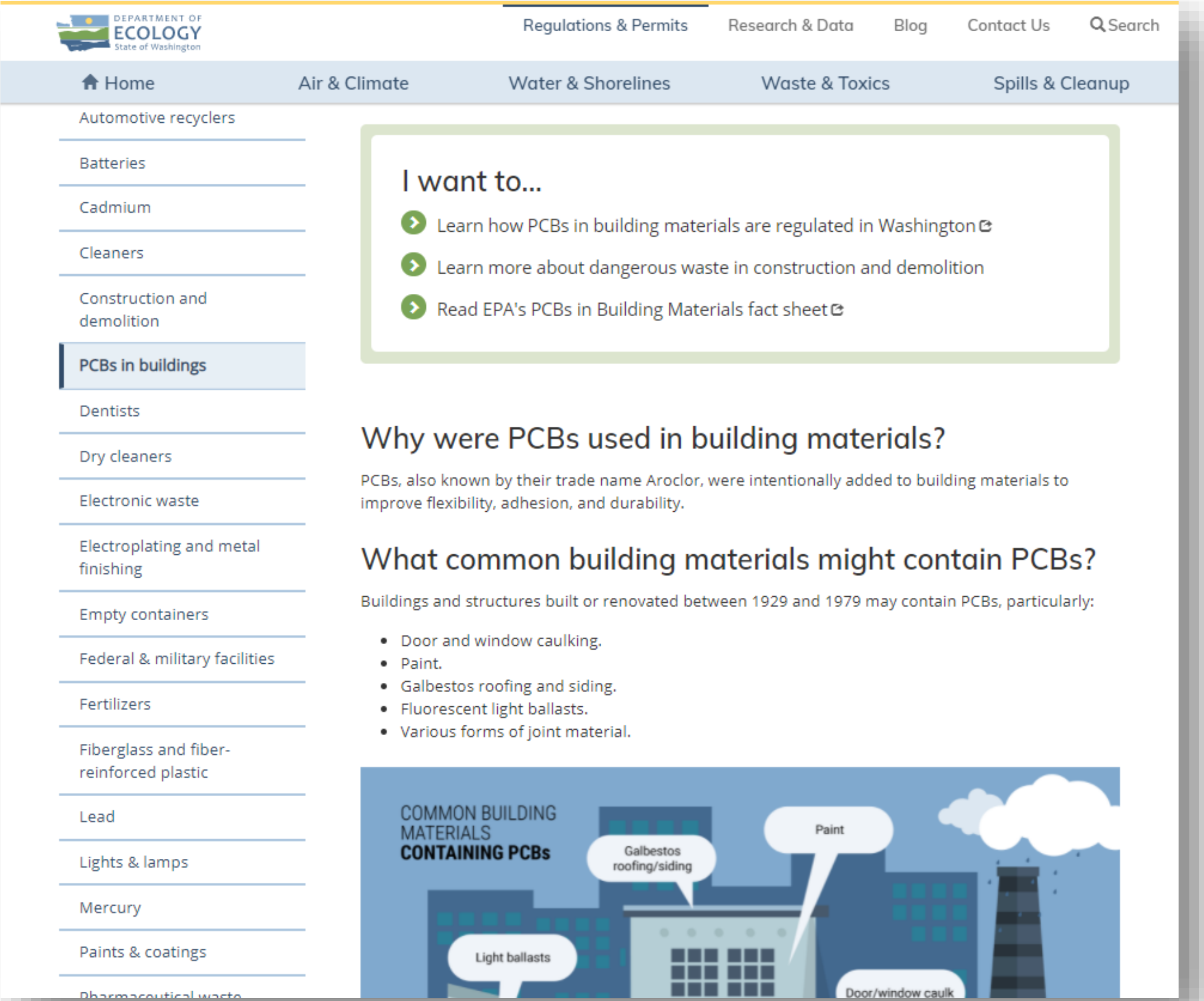
February 2015
Publication no. 15-07-002

Goals

- Develop guidance for businesses and consultants to identify, characterize, and abate during demolition or renovation
- Estimate the cost to sample and abate
- Design and propose a PCBs in Building Materials Abatement Program
  - Recommend future actions

Early Work

- Narrative Review
- Focus Sheet
- Webpage
  - Search: "ECY PCB buildings"


Regulations & Permits | Research & Data | Blog | Contact Us | Search

Home | Air & Climate | Water & Shorelines | Waste & Toxics | Spills & Cleanup

- Automotive recyclers
- Batteries
- Cadmium
- Cleaners
- Construction and demolition
- PCBs in buildings
- Dentists
- Dry cleaners
- Electronic waste
- Electroplating and metal finishing
- Empty containers
- Federal & military facilities
- Fertilizers
- Fiberglass and fiber-reinforced plastic
- Lead
- Lights & lamps
- Mercury
- Paints & coatings

I want to...

- Learn how PCBs in building materials are regulated in Washington
- Learn more about dangerous waste in construction and demolition
- Read EPA's PCBs in Building Materials fact sheet

Why were PCBs used in building materials?

PCBs, also known by their trade name Aroclor, were intentionally added to building materials to improve flexibility, adhesion, and durability.

What common building materials might contain PCBs?

Buildings and structures built or renovated between 1929 and 1979 may contain PCBs, particularly:

- Door and window caulking.
- Paint.
- Galbestos roofing and siding.
- Fluorescent light ballasts.
- Various forms of joint material.

Guidance

1. Background and regulations
2. Steps to identify and characterize:
   - Screen and inventory
   - Sample and characterize
   - Plan for demo or renovation
3. Abatement and waste management
4. Stormwater BMPs while awaiting removal

How to Find and Address PCBs in Building Materials

Prepared for:
Puget Sound National Estuary Program

Submitted by:
Washington State Department of Ecology
Olympia, Washington

October 2022, Publication 22-04-024

The U.S. Environmental Protection Agency (EPA) funded this project under the National Estuary Program (NEP), Project Tracking Number 2018-0473. The contents of this document are pursuant to Task 4.1 of the Statement of Work, and do not necessarily reflect the views and policies of EPA, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

DEPARTMENT OF ECOLOGY
State of Washington

Steps to Identify and Characterize (part 1)

Screen and Inventory:

- Building age
- Building use and structure
- Other Details
  - Suspect materials
  - Dimensions
  - Quantity

Homogeneous Material Description	Approximate Quantity	Condition	Color	PCB Potential	Homogeneous Area/Location
Window caulking 1	500 LF	Good, no damage	White to biege	Confirmed	First and second floor, exterior of building
Door caulking 2	100 LF	Poor, severe cracking	White to gray	Suspected	First floor, north and east entry ways
Old paint coating 1	2500 SF	Fair, slight peeling	Aqua green	Unknown	Interior and exterior, painted on brick and drywall

Steps to Identify and Characterize (part 2)

Sample and characterize

- Develop sampling plan
- Conduct representative testing

Greater than 50 ppm: TSCA

Less than 50 ppm: Other federal and state requirements

Table 1: Minimum number of samples based on square footage of building material.

Square Footage of Building Material	Minimum number of samples
1–1,000	3
1,000–5,000	5
More than 5,000	7

Table 2: Minimum number of samples based on linear feet of building material.

Linear Feet of Building Material	Minimum number of samples
1–50	1
50–250	3
250–1,000	5
1,000–2,500	7
More than 2,500	9

Bay Area Stormwater Management Agencies Association.

Abatement and Waste Management

- Prepare workplan
- Waste handling, storage, and disposal
- Abatement
  - Stormwater protection
  - Address exterior building materials

Building materials covered:

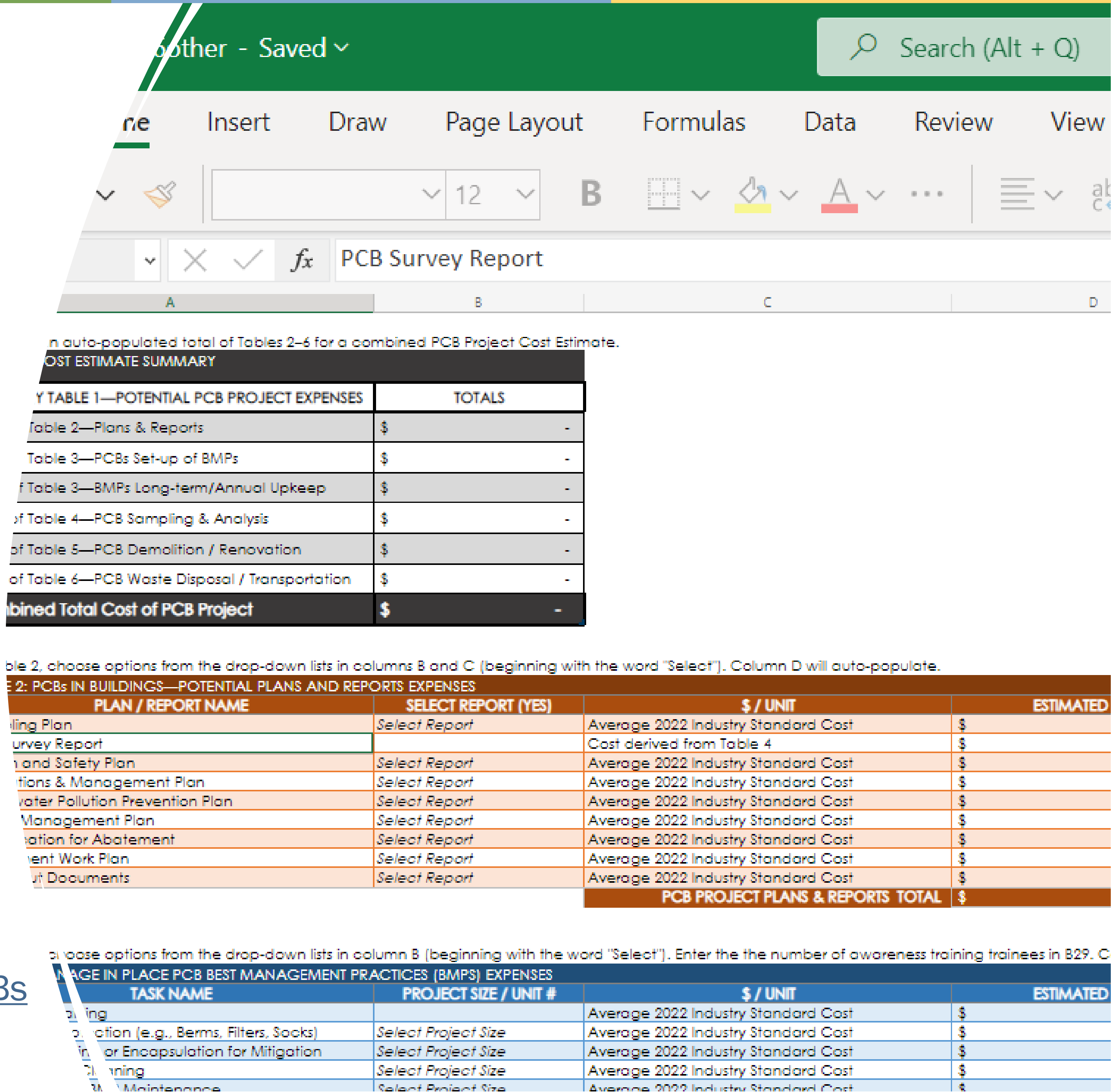
- Caulk and expansion joints
- Paints and Coatings
- Galbestos panels
- Miscellaneous materials

Stormwater BMPs While Awaiting Removal

- ❑ Training and awareness
- ❑ Coordinate with your municipality
- ❑ Plan for wet weather
- ❑ Inspect regularly
- ❑ Collect eroded materials
- ❑ Prevent PCB-contaminated particles from migrating
- ❑ Cover materials
- ❑ Protect storm drain system
- ❑ Avoid washing
- ❑ Reconsider landscaping

How to Estimate Abatement Project Costs

- Potential plans and reports
- Best management practices
- Sampling and analysis
- Demolition and/or renovation
- Waste disposal and transportation



[How to Estimate Abatement Project Costs for PCBs in Building Materials (wa.gov)]

How to Estimate Abatement Projects

Assumptions

- Labor
- Materials
- Disposal
- Contractor Markups

Didn’t consider: Utilities, building height, sidewalk and street permits, noise restrictions, and others

Proposed Next Steps

- Education and Outreach

- Research and Data Collection
  - Evaluate other building materials management programs (e.g. Lead, Asbestos)
  - Map and identify high priority buildings
  - Conduct source tracing in stormwater systems
  - PCB abatement pilot study
  - Measure the impact to stormwater runoff prior to and during abatement activities

Proposed Next Steps

- Incentives and Funding
  - Leverage existing funding programs, such as NEP and the WQ Combined Funding Program, to conduct stormwater BMP effectiveness studies.
  - Establish an incentive program for buildings that serve vulnerable populations.

- Policy
  - Work with EPA to identify ways to reduce the regulatory burden on small businesses.
  - Require investigation of potential PCB-containing materials as part of building permitting associated with re-development.
  - Require businesses to investigate PCBs as part of Environmental Site Assessments (ESA) associated with property title transfer.
  - Add requirements to identify and manage PCBs in building materials in the next Washington State Construction Stormwater General Permit (CSWGP)

Thank you

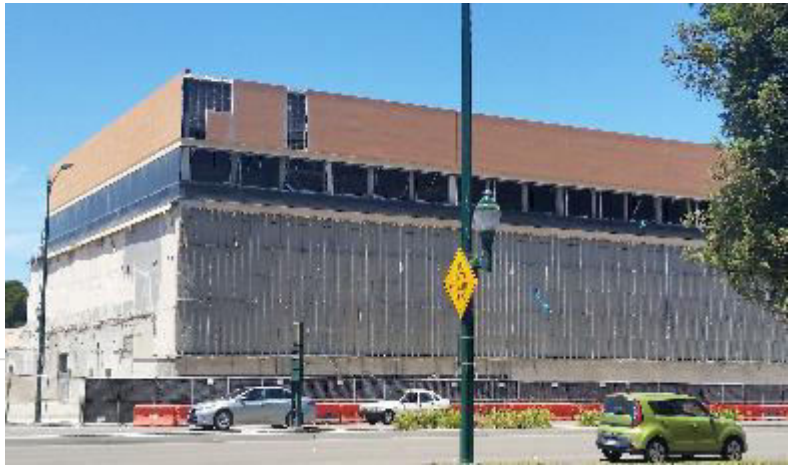
Seattle Public Utilities

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

PUGET SOUND
National Estuary Program

PUGETSOUND PARTNERSHIP
EPA United States Environmental Protection Agency
Washington Stormwater Center
Washington State Department of Natural Resources
Washington Department of Fish and Wildlife
Washington State Department of Health
Northwest Indian Fisheries Commission
Department of Ecology State of Washington
Department of Commerce
Innovation is in our nature.

PCBs and Building Demolition



Managing PCBs in Priority Building Materials in the San Francisco Bay Area – November 1, 2023

Reid Bogert – San Mateo Countywide Water Pollution Prevention Program

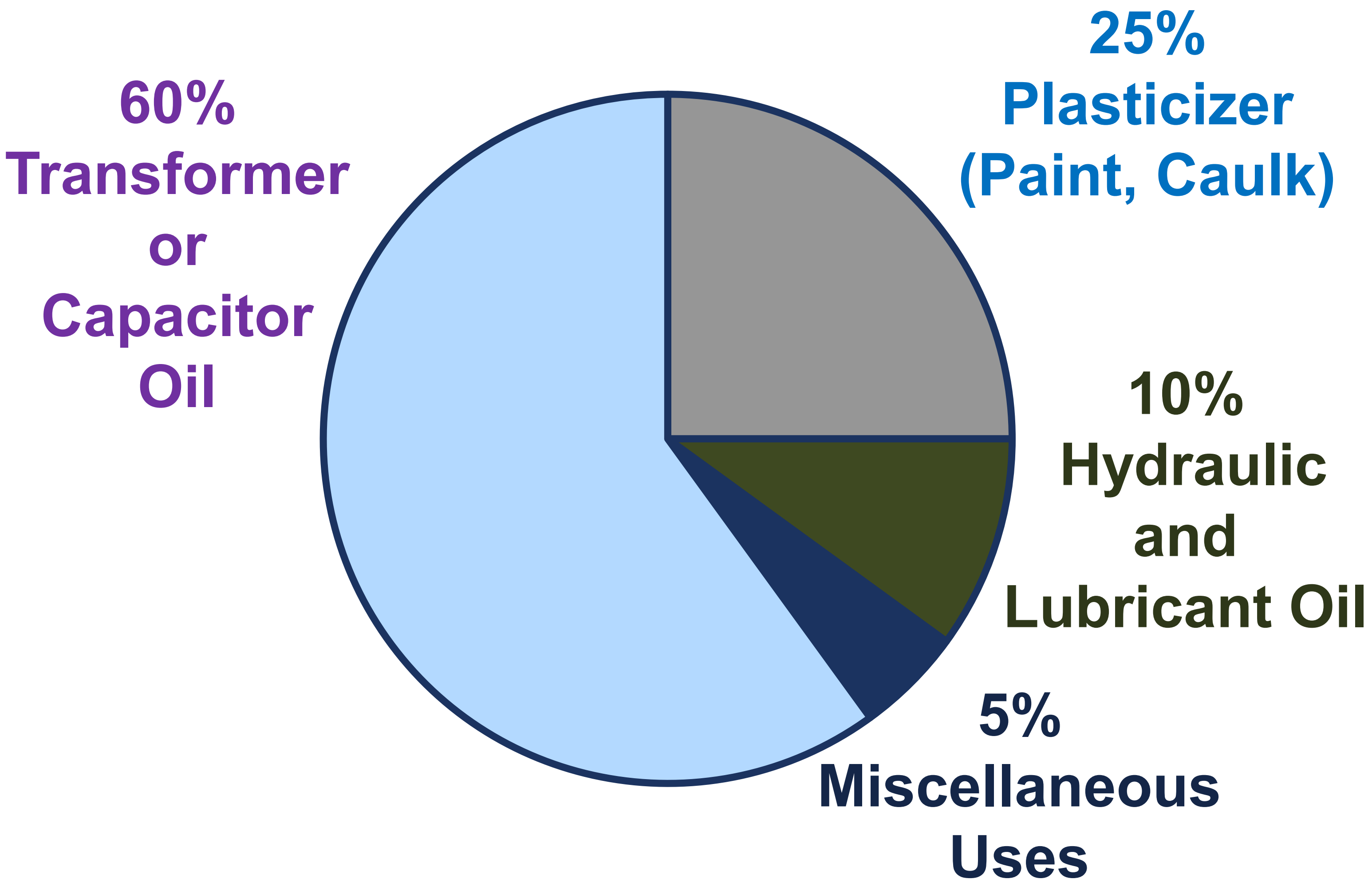
Goals for Today's Meeting

- Background: Why are PCBs a Problem?
- MRP 2.0 PCBs Building Demolition Requirements
- MRP 2.0 Tools and Guidance
- Overview of MRP 2.0 Demolition Permit Review Process
- MRP 3.0 PCBs Building Demolition Requirements
- MRP 3.0 Tools and Guidance
- Overview of MRP 3.0 Demolition Permit Review Process
- Questions

Background – Why are PCBs a Problem?

PCBs Were Manufactured From 1929 to 1979

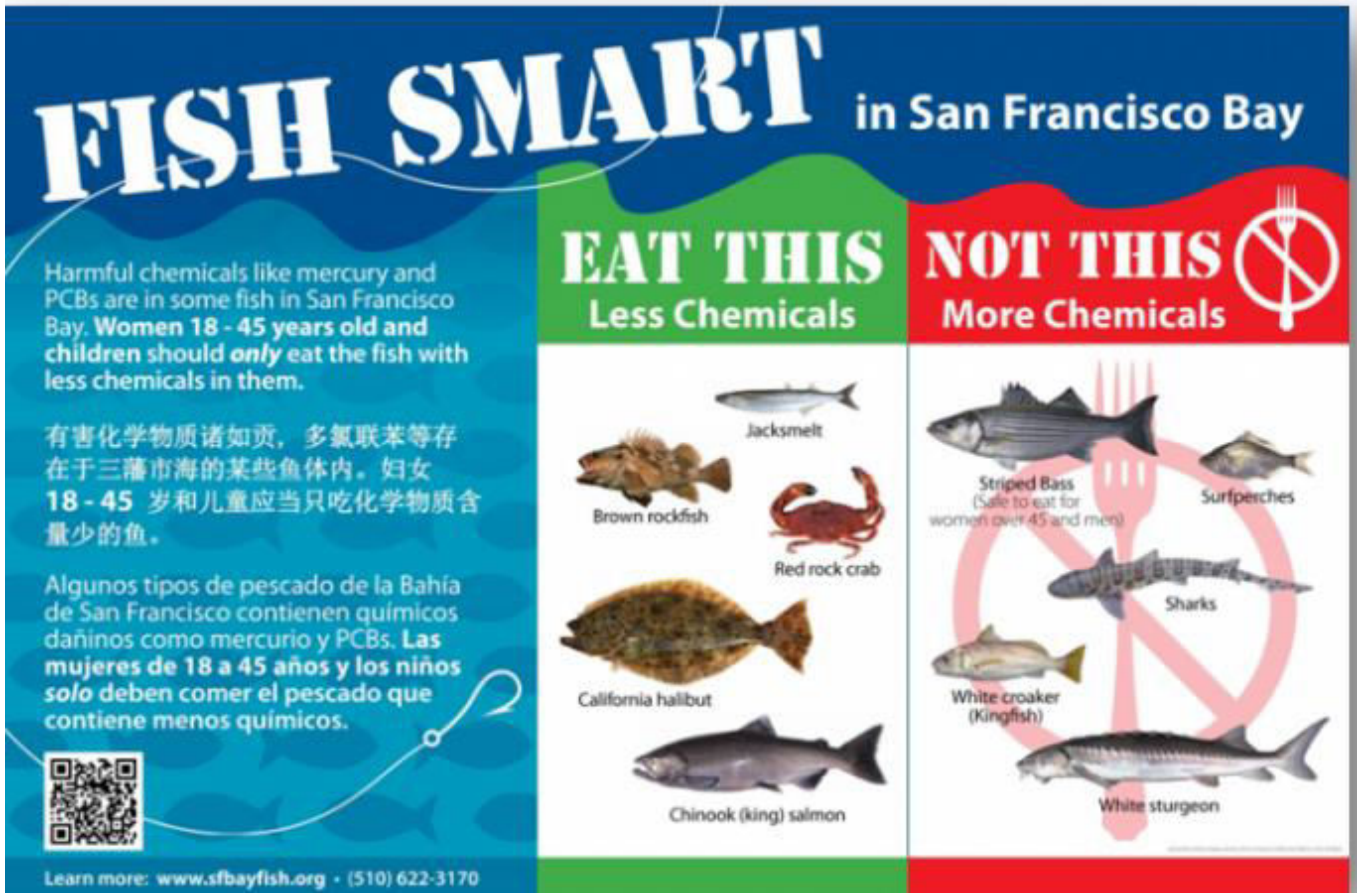
Due to their chemical stability, PCBs were widely used during this period



PCBs in the Bay May Impact Human Health

- San Francisco Bay is impaired by PCBs concentrations in fish
- Concentrations increase as you move up the food chain
- Exposure results in cancer risk and other health concerns

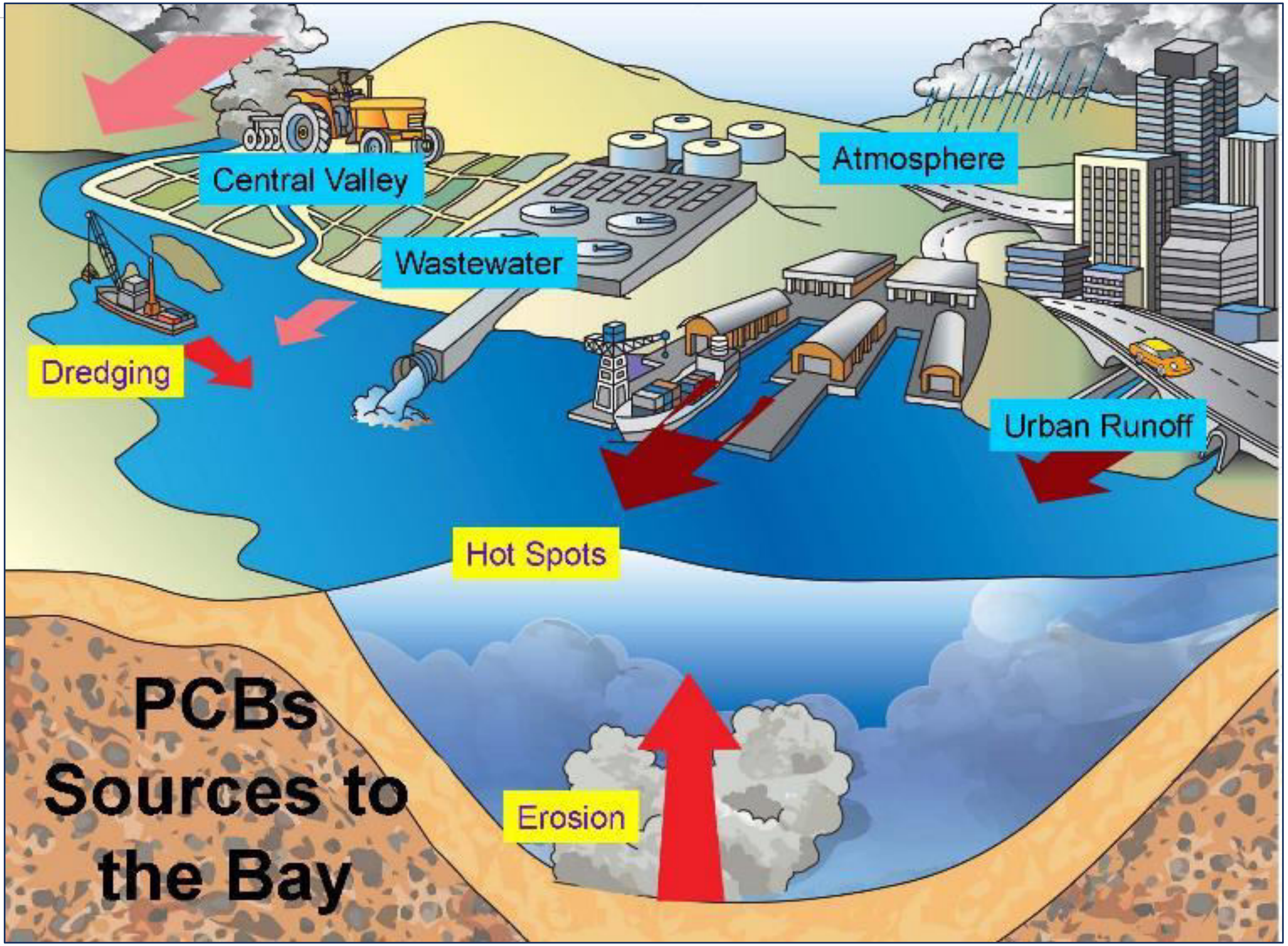
Many Bay Fish Are Not Safe to Eat



Fish consumption advisories led to the development of a pollution "diet" for PCBs known as a Total Maximum Daily Load (TMDL).

The SF Bay TMDL Identified Many Legacy Sources

- The TMDL analyzed all legacy sources
- Stormwater was identified as the largest source
    - TMDL seeks 90% reduction in stormwater sources
    - Building demolition was identified as a major source to urban stormwater



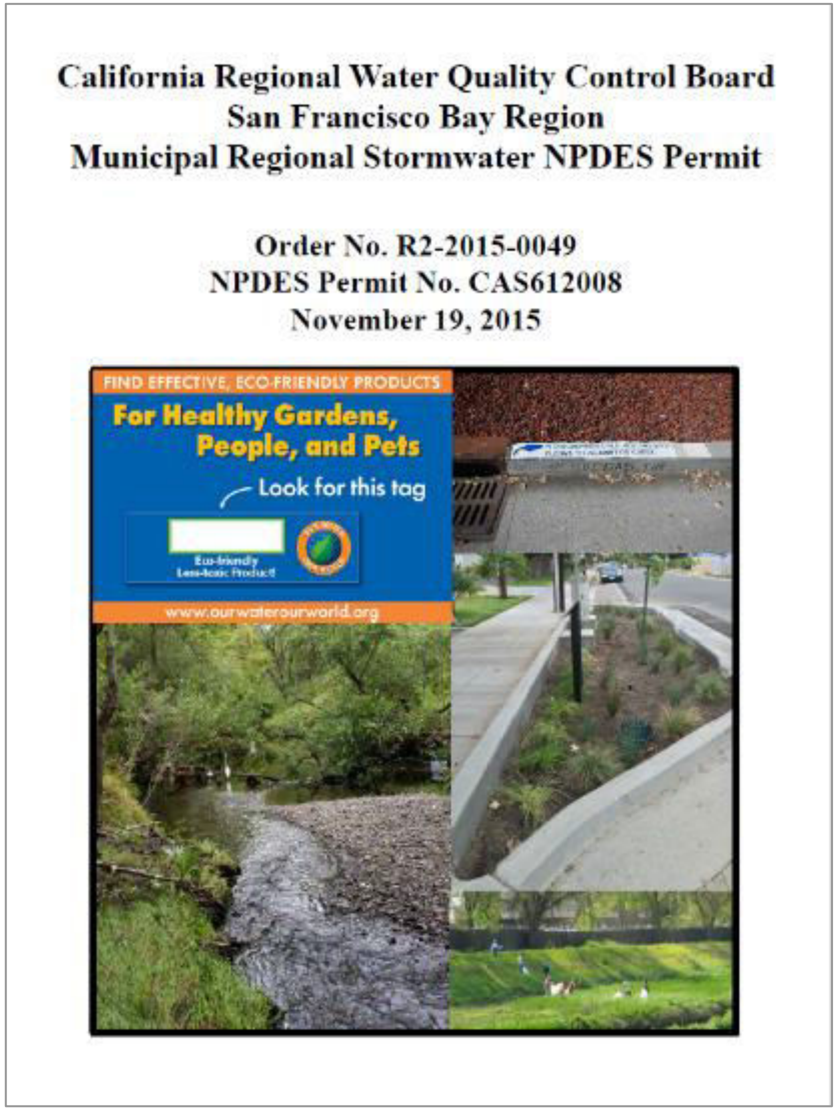
Numerous Actions Underway to Improve Water Quality in SF Bay

- **Industry** and the **military** are cleaning up “hot-spot” sites
- **Dredgers** are testing Bay sediments and properly disposing of materials with high levels of PCBs
- Municipal **wastewater treatment** plant operators are using advanced methods to test for PCBs in treated wastewater
- **Municipalities** are reducing PCBs in runoff by:
  - Identifying source properties for abatement
  - Developing green infrastructure
  - Developing programs to manage PCBs in building materials during demolition

Monitoring and data analysis will be used to review the underlying science and efficacy of this work.

Municipal Regional NPDES Permit 2.0 Requirements

MRP Provision C.12.f: Manage PCBs-Containing Building Materials During Demolition


California Regional Water Quality Control Board
San Francisco Bay Region
Municipal Regional Stormwater NPDES Permit

Order No. R2-2015-0049
NPDES Permit No. CAS612008
November 19, 2015

- Developed protocol to manage PCBs-containing materials during demolition
  - Ensure PCBs are not discharged to storm drains when applicable buildings are demolished
  - Include a method for identifying applicable buildings prior to demolition
  - Provide for the necessary authority to implement the program
- Applicable to buildings constructed/remodeled between Jan 1, 1950 & Dec 31,1980
  - The requirements do not apply to wood frame buildings or single family residences
- Programs were implemented on <u>July 1, 2019</u>


Caulk along window frame
PCB-laden caulk along door frame

Each Program Requires the Following Components

Necessary Components of a Successful Program
A mechanism to establish municipal authority (e.g., ordinance, resolution or policy)
CEQA Notice of Exemption
Application package for demolition permit applicants (e.g., with forms, instructions and process flow chart)
A building survey protocol for applicants
A cost recovery mechanism to comply with MRP Provision C.12.f. (if desired)
A process to train relevant staff to implement the new program
A process to submit completed data forms to BASMAA and/or the countywide stormwater program

BASMAA prepared model documents to support all program components.

BASMAA (now the Bay Area Municipal Stormwater Collaborative) Developed Guidance and Materials

- Identified the high priority PCBs-containing building materials
- Developed a protocol for managing PCBs-containing materials during building demolition
- Developed model regulatory processes that can be incorporated into the building demolition permitting process

Key project elements were vetted through a Technical Advisory Group that included representatives from EPA, DTSC, the Regional Board, industry, and municipalities.

Bay Area Stormwater Management Agencies Association

Key Definitions

- **Demolition**
  - Demolition means the wrecking, razing, or tearing down of any structure. The definition is intended to be consistent with the demolition activities undertaken by contractors with a C-21 Building Moving/Demolition Contractor’s License
- **Priority Building Materials**
  - Priority building materials are: caulk; thermal or fiberglass insulation; adhesive mastics; and rubber window gaskets
- **Applicable Structures**
  - Applicable structures are defined as structures built or remodeled between 1950 and 1980, except that wood framed structures and single-family residential structures are not applicable structure regardless of the age of the building

Five Priority Building Materials




Caulk/Sealants/Adhesives:
- Caulk
- Rubber Window Gaskets
- Mastic

Insulation:
- Thermal
- Fiberglass

Note that fluorescent light ballasts, polyurethane foam furniture, and Askarel fluid used in transformers, all of which may contain PCBs, are typically managed during pre-demolition activities under current regulations and programs that require removal of universal waste and outdated transformers. For this process it is assumed that those materials will be evaluated and managed under those existing programs.

MRP 2.0 Implementation Process Overview

Municipality establishes PCBs building demo requirements

- adopts legal mechanism
- notifies applicants

Applicant conducts PCBs screening assessment

"Non-applicable structure" or PCBs <50 ppm*

Applicant submits self-certified form to municipality. No further requirements for the PCBs Demolition Program.

PCBs ≥50 ppm

Applicant reports concentration and estimates volume of PCBs-containing priority building materials and submits self-certified form to municipality. Applicant follows applicable federal and state laws.

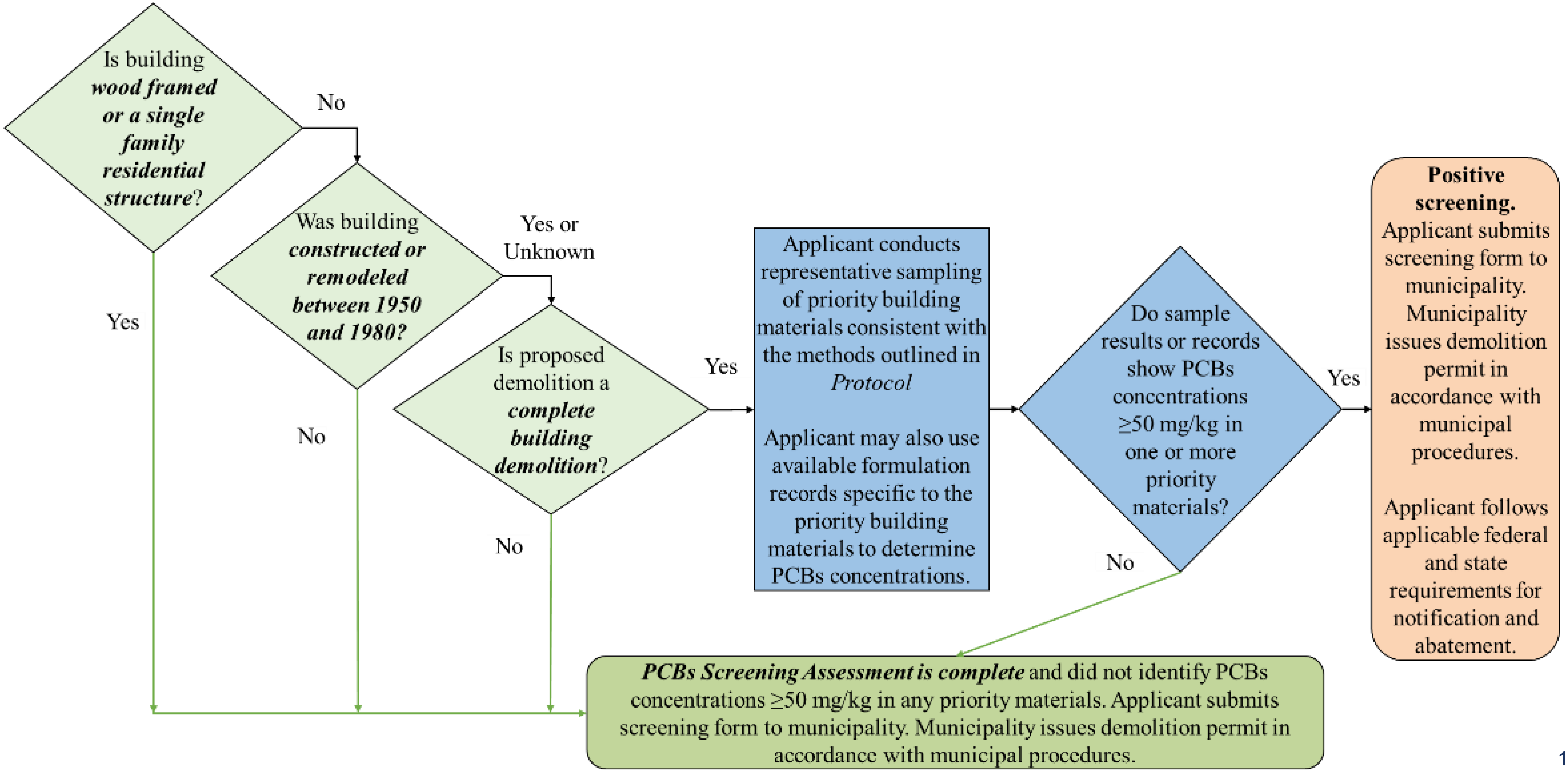
* Building owners may still have PCBs obligations under federal or state laws, but this is outside the PCBs Demolition Program

Applicant Role in the Process

- Completes and submits Assessment Form
  - Building is "screened out" – "non-applicable structure"; or PCBs <50 ppm
  - Building is "screened in" – found PCBs ≥50 ppm
- "Screened Out"
  - Demolition follows normal process
  - Building owners may still have PCBs obligations under federal or state laws, but this is outside the PCBs Demolition Program
- "Screened In"
  - Building owners follows state and federal laws regarding abatement and disposal of PCBs-containing materials and wastes

Steps For Applicants

What They Must Consider and Do Prior to Obtaining Demolition Permit



PCBs in Priority Building Materials: Model Screening Assessment Applicant Package

Managing PCBs–Containing Building Materials during Demolition: Guidance, Tools, Outreach and Training

Bay Area Stormwater Management Agencies Association

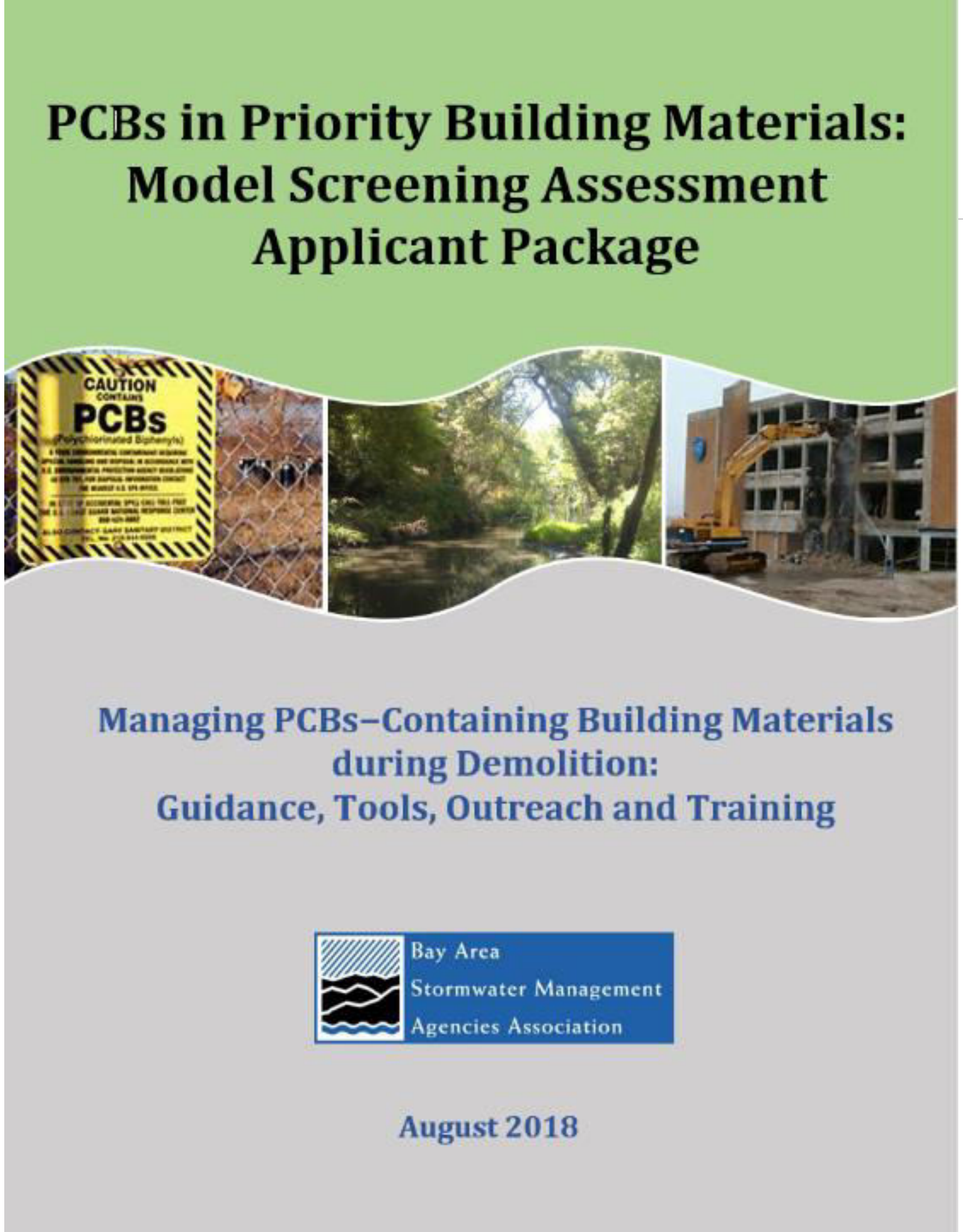
August 2018

Protocol for Evaluating Priority PCBs-Containing Materials before Building Demolition

Managing PCBs–Containing Building Materials during Demolition: Guidance, Tools, Outreach and Training

Bay Area Stormwater Management Agencies Association

August 2018


PCBs in Priority Building Materials:
Model Screening Assessment
Applicant Package

Managing PCBs–Containing Building Materials during Demolition:
Guidance, Tools, Outreach and Training

Bay Area Stormwater Management Agencies Association

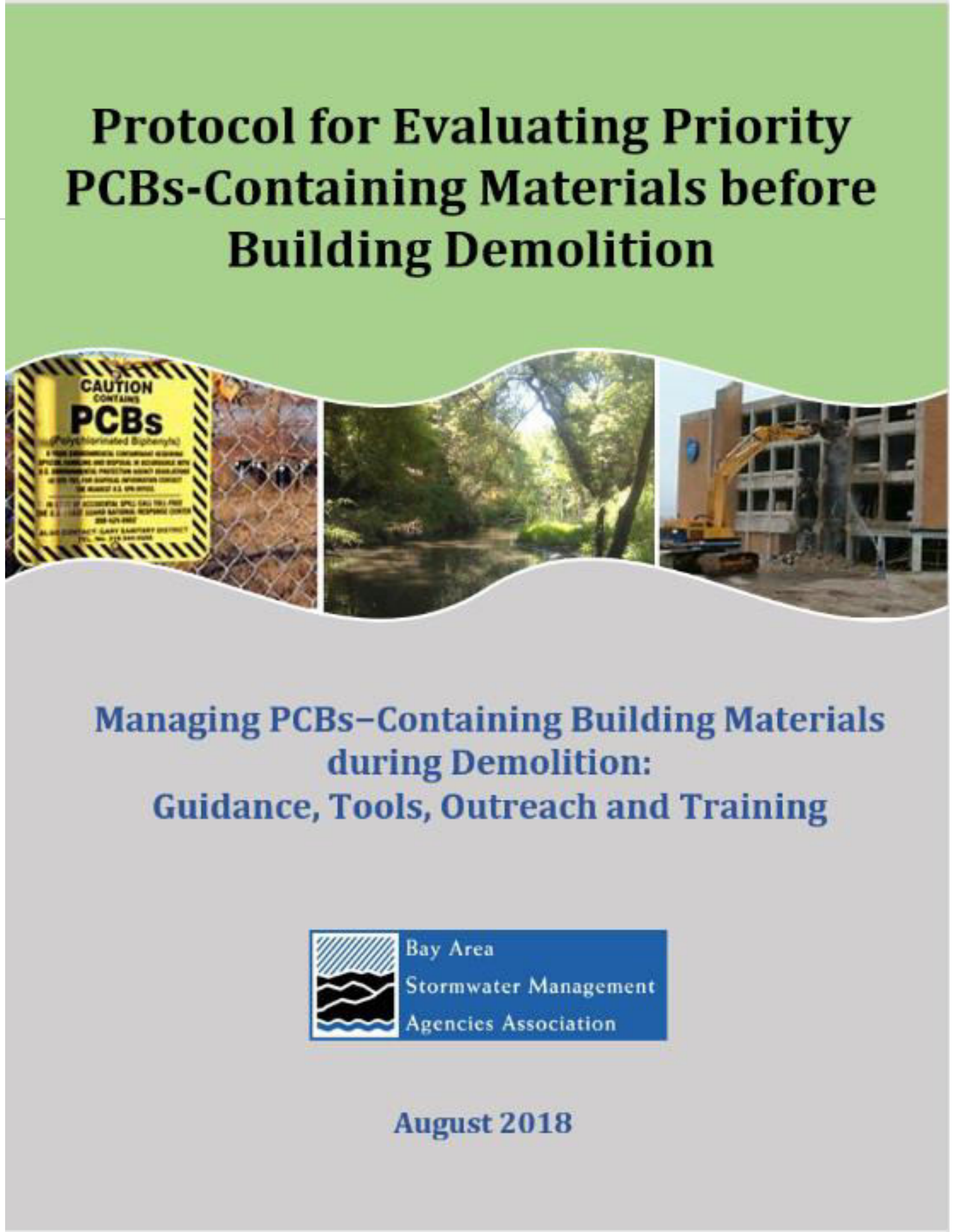
August 2018

Applicant Package

- Process overview
  - Background information
- Applicant instructions
  - Direction on completing the form questions
- Process flow chart
- Assessment form (Application)
- Supporting information

Protocol for the PCB Evaluation Before Demolition

- Section 3.1: identifies priority materials to be tested
- Section 3.2: describes PCBs sampling procedures
  - Equipment
  - Frequency
  - Analysis and preservation
  - Quality Assurance and Quality Control Check List
- Appendix B: provides photo examples of the priority materials



Notices to applicants: This is not the only program regulating PCBs

Notices to Applicants Regarding Federal and State PCBs Regulations

Applicants that determine PCBs exist building materials must follow applicable federal and state laws. This may include reporting to U.S. Environmental Protection Agency (USEPA), the San Francisco Bay Regional Water Quality Control Board, and the California Department of Toxic Substances Control (DTSC). These agencies may require additional sampling and abatement of PCBs. Depending on the approach for sampling and removing building materials containing PCBs, you may need to notify or seek advance approval from USEPA before building demolition. Even in circumstances where advance notification to or approval from USEPA is not required before the demolition activity, the disposal of PCBs waste is regulated under TSCA and the California Code of Regulations. (See Note 1)

Note 1 - Federal and State Regulations

Building materials containing PCBs at or above 50 ppm that were manufactured with PCBs (e.g., caulk, joint sealants, paint) fall under the category of PCBs bulk product wastes. See 40 Code of Federal Regulations (CFR) 761.3 for a definition of PCBs bulk product wastes.

Building materials such as concrete, brick, metal contaminated with PCBs are PCBs remediation wastes (e.g., concrete contaminated with PCBs from caulk that contains PCBs). 40 CFR 761.3 defines PCBs remediation wastes.

Disposal of PCBs wastes are subject to TSCA requirements such as manifesting of the waste for transportation and disposal. See 40 CFR 761 and 40 CFR 761, Subpart K.

TSCA-regulated does not equate solely to materials containing PCBs at or above 50 ppm. There are circumstances in which materials containing PCBs below 50 ppm are subject to regulation under TSCA. See 40 CFR 761.61(a)(5)(i)(B)(2)(ii).

Disposal of PCBs wastes are subject to California Code of Regulations (CCR) Title 22, Section Division 4.5, Chapter 12, Standards Applicable to Hazardous Waste Generators.

California hazardous waste regulatory levels for PCBs are 5 ppm based on the Soluble Threshold Limit Concentration test and 50 ppm based on the Total Threshold Limit Concentration test, see CCR, Title 22, Section 66261.24, Table III.

Recommend Building Owners That Identify PCBs in Their Buildings Review EPA Information

EPA United States Environmental Protection Agency

Environmental Topics | Laws & Regulations | About EPA | Search EPA.gov

CONTACT US SHARE

Polychlorinated Biphenyls (PCBs)

- PCBs Home
- Learn about PCBs
- Policy and Guidance
  - Cleanup of PCB Waste
  - PCBs in Ships
- Disposal and Notifications
- PCBs in Building Materials
- Regional PCB Programs

PCB Facility Approval Streamlining Toolbox (FAST): Streamlining the Cleanup Approval Process

The PCB FAST is designed to help Responsible Parties (RPs) and regulators, whenever possible, reduce delays, improve communication, and increase efficiency in the cleanup and disposal of PCBs at a site. PCB FAST focuses on establishing a collaborative working relationship between EPA and the RPs and providing tools to be used by RPs to prepare adequate and appropriate cleanup notifications and applications. The Toolbox includes guidance, process flow maps, and checklists to facilitate streamlined cleanup processes. These resources can be customized to meet each site or Region's needs.

https://www.epa.gov/pcbs/pcb-facility-approval-streamlining-toolbox-fast-streamlining-cleanup-approval-process

Municipal Regional NPDES Permit 3.0 Requirements

For Applicants and Municipalities

MRP 3.0 Process Changes Overview

Municipality enhances PCBs building demo program

- Legal mechanism
- Notify applicants
- Updates application

Applicant conducts PCBs screening assessment

"Non-applicable structure" or PCBs <50 ppm*

Applicant submits self-certified form to municipality. No further requirements for the PCBs Demolition Program.

PCBs ≥50 ppm

Applicant reports concentration and estimates volume of PCBs-containing priority building materials and submits self-certified form to municipality. Applicant follows applicable federal and state laws. Applicant certifies that they will make the required notifications.

Municipal Follow-up:

- **Receive hazardous waste manifests**
- **Receive notice of start of demolition**
- **Inspect demolition sites**
- **Enhance construction site control program**

* Building owners may still have PCBs obligations under federal or state laws, but this is outside the PCBs Demolition Program

Overview of MRP 3.0 Requirements for Applicants

1. Updates in Applicant package
   - Notifications
   - Certifications

2. Responding to Municipal inspectors and possible increased inspections

3. Possible additional BMPs required by municipality

PCBs in Priority Building Materials: Model Screening Assessment Applicant Package

Managing PCBs–Containing Building Materials during Demolition: Guidance, Tools, Outreach and Training

Bay Area Stormwater Management Agencies Association

August 2018
(Revised November 2019 and May 2023)

Updates to Applicant Package

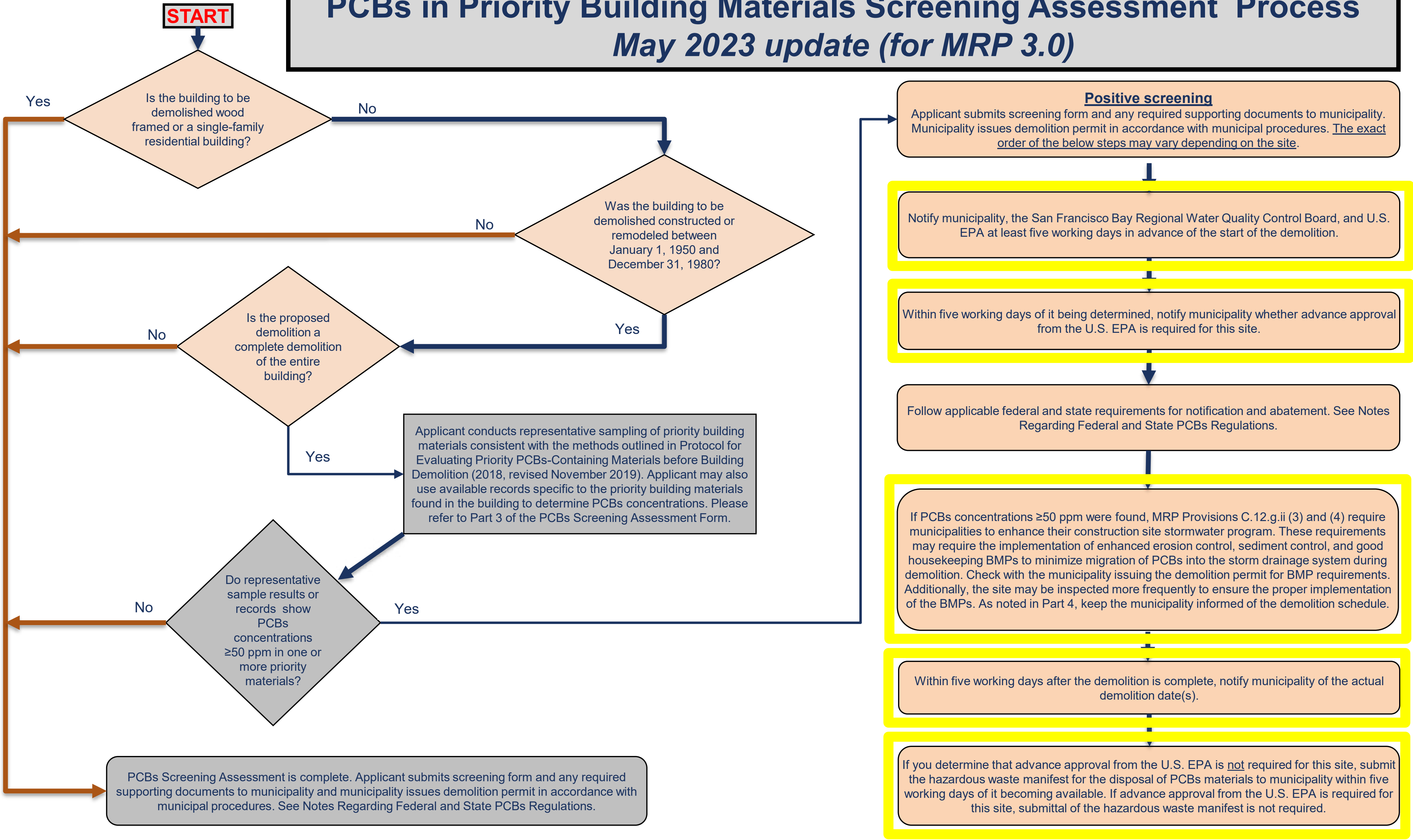
- If Applicant has applicable structures and concentrations of PCBs ≥ 50 ppm, required to certify that they will notify regulatory agencies at various stages
- Consequences for non-compliance are now detailed
- Applicant must make determinations on whether advance approval from US EPA is required
- Alerted that municipality now has additional inspection and BMP requirements

MRP 3.0 – Notification details in Applicant package

IF the site has applicable structures and contains building materials with PCBs concentrations ≥ 50 ppm, must certify that they will:

- Notify the Municipality, the SF Regional Board, and US EPA five working days in advance of the start of demolition;
- Within five working days after demolition is complete, notify the Municipality of the actual date of completion;
- Within five working days of it being determined, notify the Municipality whether advance approval from the US EPA is required for the site;
- Within five working days of it becoming available, submit hazardous waste manifest for the disposal of the PCBs materials to the Municipality, if advance approval is determined not to be required.

PCBs in Priority Building Materials Screening Assessment Process
May 2023 update (for MRP 3.0)



Overview of MRP 3.0 Requirements for Permittees

1. Required to inspect applicable structures (demolition sites) with PCBs-containing building materials (detection of ≥ 50 ppm) during the rainy season (starting 10/1/23) to ensure that effective controls are used to prevent discharges.
   [see Provision C.12.g.ii(3)]

2. Required to enhance municipal construction site control programs (effective 7/1/23) to minimize migration of PCBs into the MS4 during demolition activities any time of the year.
   [see Provision C.12.g.ii(4)]

BAMSC Guidance for Construction Site Control Program Enhancements (for Demolition Sites)

- Technical Memorandum
- Baseline Program (TM Table 1)
  - Inspect once during the wet season during demolition
  - If site falls under C.6.e Construction Site Inspection Program (i.e., ≥ 1 acre, hillside site, or high priority site) monthly inspections also apply
- Enhancement Options (TM Table 2)
  - Additional Inspections (Dry season, Wet season or Pre-demolition)
  - Require BMPs
    - Street sweeping daily during demolition
    - Street sweeping daily during all phases of construction
    - Cover demolition debris with impermeable liner during wet season (CGP BMP*)
    - Cover demolition debris with impermeable liner during wet and dry season
    - Establish set of BMP requirements for demolition projects and review SWPPP

BAMSC Guidance for Construction Site Control Program Enhancements (for Demolition Sites)

- Establish Set of BMP Requirements (TM Table 3)
  - Erosion Control
  - Run-on and Runoff Control
  - Sediment Control
  - Good Site Management
    - Dust Control
    - Waste Management
    - Materials Management
  - Non-stormwater Management

BAMSC Guidance for Construction Site Control Program Enhancements

- Establish Set of BMP Requirements (TM Table 3)
  - Erosion Control
    - Provide temporary soil stabilization with hydroseeding, soil binders, or erosion control blankets for all disturbed soils within 14-days of the area becoming inactive.
    - Provide temporary soil stabilization with erosion control blankets or geotextiles disturbed soils in the demolition zone when rain is predicted.
    - Use water and/or dust palliatives to manage dust during the demolition process. Dust control water must be managed to prevent runoff or collected for proper disposal.
  - Run-on and Runoff Control
    - Use earth dikes, drainage swales and/or other controls to direct run-on away from demolition site and debris storage areas.
    - Use earth dikes, drainage swales and/or other controls to direct runoff from the site to sediment controls.

BAMSC Guidance for Construction Site Control Program Enhancements (Continued)

- Establish Set of BMP Requirements (TM Table 3)
  - Sediment Control
    - Install site perimeter controls (e.g., wattles, silt fences) around the project site.
    - Install perimeter controls (e.g., wattles, silt fences) around the demolition area and debris management areas.
    - Install stabilized entrances to minimize sediment track-out.
    - Sweep streets and pavement on the project site and adjacent streets using vacuum or regenerative air sweepers to effectively remove sediment, dust, and debris.
    - Install inlet protection at all on-site and off-site storm drain inlets that receive project runoff.
  - Good Site Management
    - Dust Control - Use manual tools or tools that employ misters, e.g., wet sanders to generate lower dust volumes. Water must be collected for proper disposal.
    - Dust Control - Construct work containment zones to prevent spread of potentially contaminated dust – use plastic sheeting, vacuum, and/or install a decontamination area.

BAMSC Guidance for Construction Site Control Program Enhancements (Continued)

- Establish Set of BMP Requirements (TM Table 3)
  - Good Site Management
    - Waste Management - Cover demolition debris with an impermeable liner or place into covered leak tight debris bins.
    - Waste Management – Properly dispose of wastes (debris, liquid, and BMPs). Maintain waste disposal records (e.g., manifests, bills of lading) and submit to the local agency and EPA as required.
    - Materials Management - Decontaminate equipment before storing outdoors or using in other parts of the project.
  - Non-stormwater Management
    - Contain decontamination water in covered leak-tight containers inside a building or inside secondary containment.

Ramping Up

- Preparation for for July 1, 2023 Deadline:
  - Determine task responsibilities:
    - Demolition Phase Inspector (e.g., C.6 Inspectors, Building Inspectors, Public Works etc.)
    - PCBs Program Coordinator (for waste manifests, EPA coordination/reporting)
    - Engage Chief Building Official, Legal Counsel
    - Create timeline/schedule for flow of information/documentation (e.g., notification internally between municipal staff and departments)
  - Brief municipal leaders, as needed
    - Advise City/Town Manager, Building Official, Public Works Director
  - Revise applicable permit processes (demolition, building)
    - Work with staff to determine whether you need a new process or can integrate questions into an existing process
    - Amend C&D recycling process, if needed.
    - Revise tracking methods, as needed.

Annual Reporting Requirements

- Annually Report
- Number of applicable structures applied for demolition permit
  - Running list of applicable structures that applied for demolition permit since July 1, 2019, number of samples, and PCBs concentrations
  - For each applicable structure, with PCBs ≥50 mg/kg: project address, demolition date, and brief description of PCBs-containing materials
  - For each structure that was constructed or remodeled between the years 1950 and 1980 and requires emergency demolition: address, date building was constructed, and date of demolition

Annual Reporting Requirements

- Beginning w/2024 Annual Reports
  - Whether the site was inspected during demolition
  - For cases where notification/advance approval from U.S. EPA is not required, and were approved for demolition after June 30, 2023, the hazardous waste manifest prepared for transportation of the material to a disposal facility

- 2026 Annual Report only
  - Submit an evaluation of the effectiveness of the protocol for controlling PCBs during building demolition as well as supporting data
  - Permittees may submit for use in the subsequent permit term an updated assessment methodology and data collection program

Questions/Discussion

Reid Bogert – Stormwater Program Director
San Mateo Countywide Water Pollution Prevention Program
City/County Association of Governments of San Mateo County
rbogert@smcgov.org
www.Flowstobay.org

C/CAG City/County Association of Governments of San Mateo County

flowstobay.org SAN MATEO COUNTYWIDE WATER POLLUTION PREVENTION PROGRAM Clean Water. Healthy Community.

Concentrations and Emissions of PCBs from School Building Materials

Keri Hornbuckle
Department of Civil & Environmental Engineering
University of Iowa
Iowa City, Iowa, USA

November 1, 2023

ISRP

IOWA SUPERFUND
RESEARCH PROGRAM

Metabolism

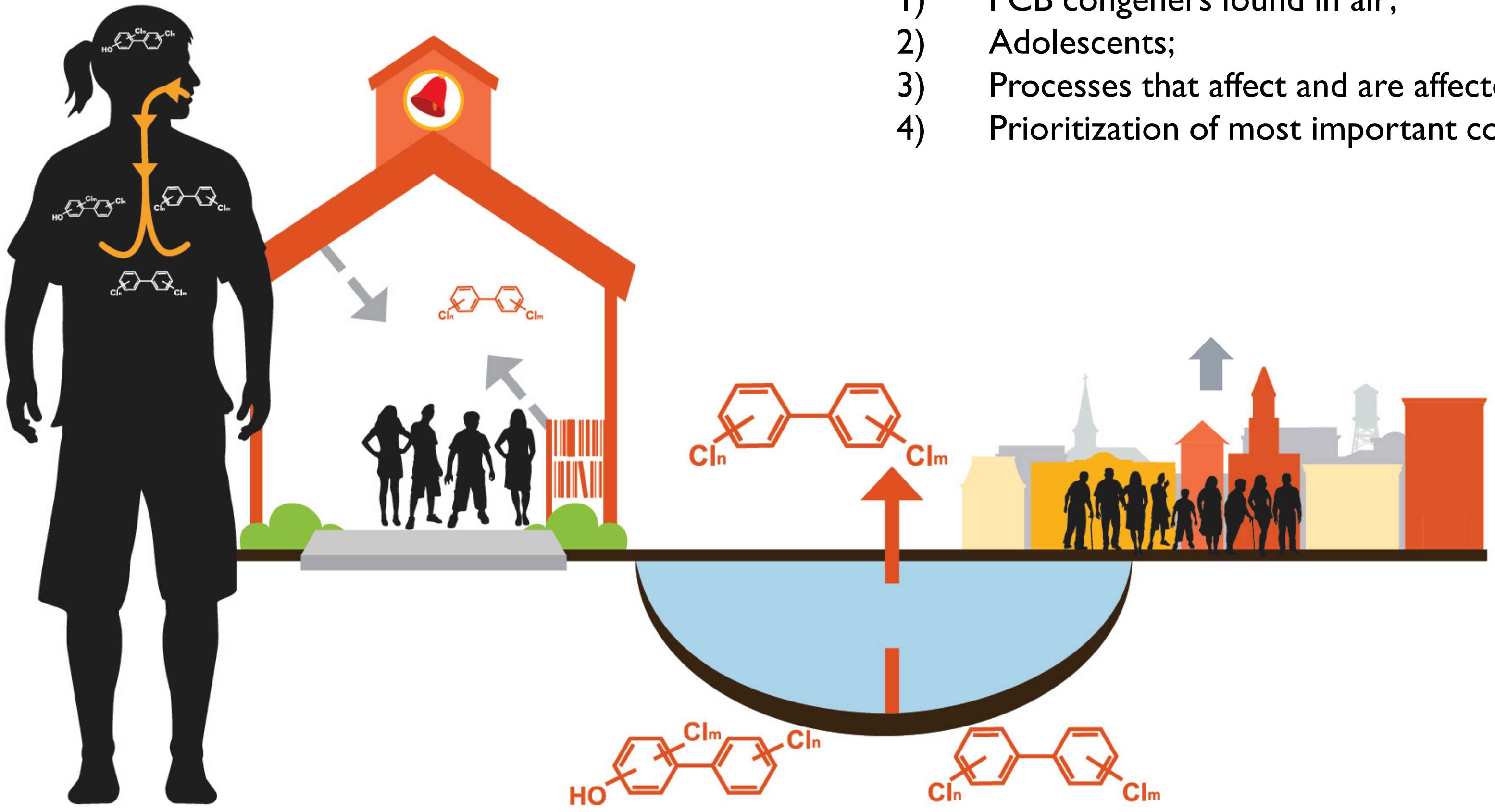
Airborne PCBs: Sources, Exposures, ^ Toxicities, Remediation

NIH National Institute of Environmental Health Sciences
Superfund Research Program

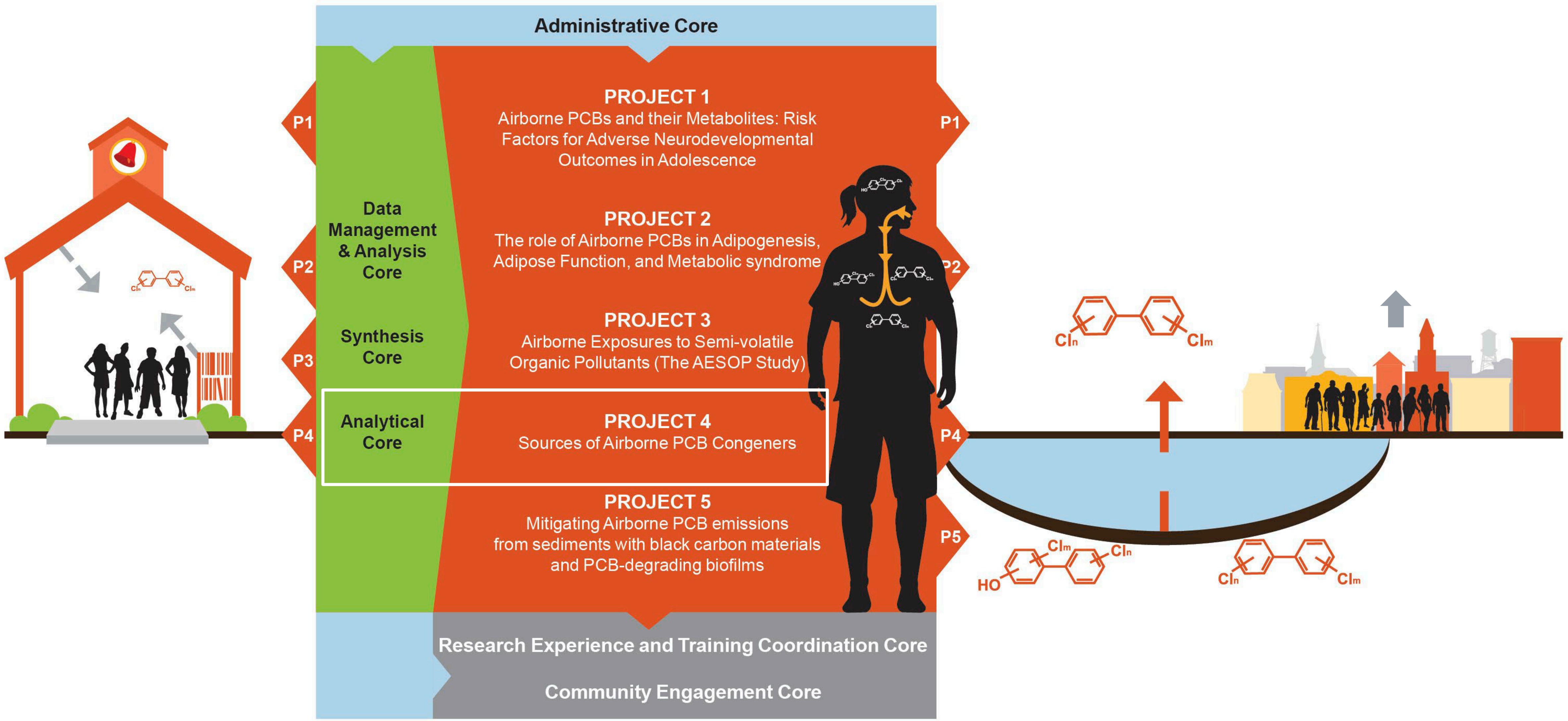
IOWA

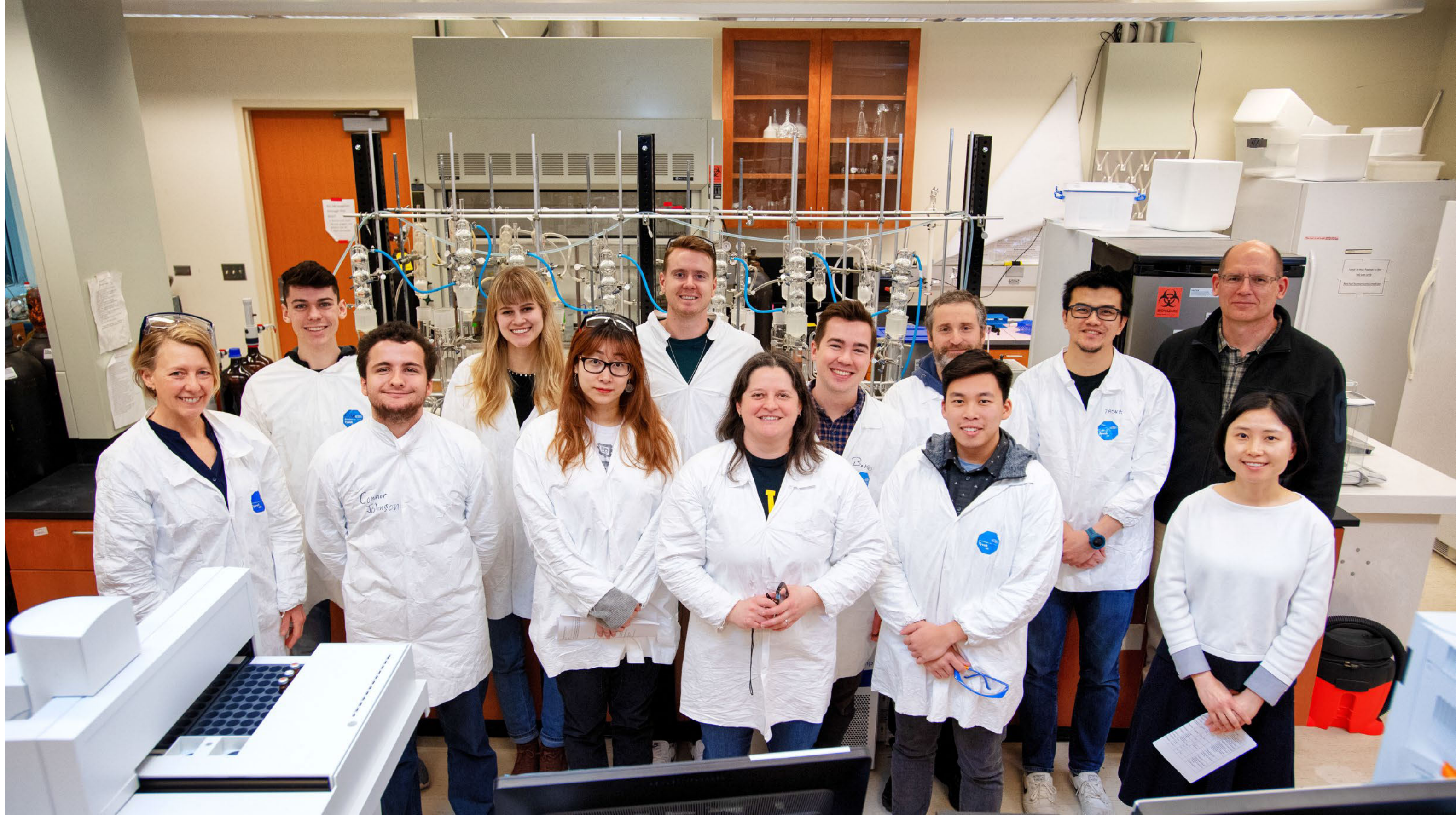
IOWA SUPERFUND RESEARCH PROGRAM

1) PCB congeners found in air;
2) Adolescents;
3) Processes that affect and are affected by the metabolism of PCBs; and
4) Prioritization of most important contributors to human health risk.



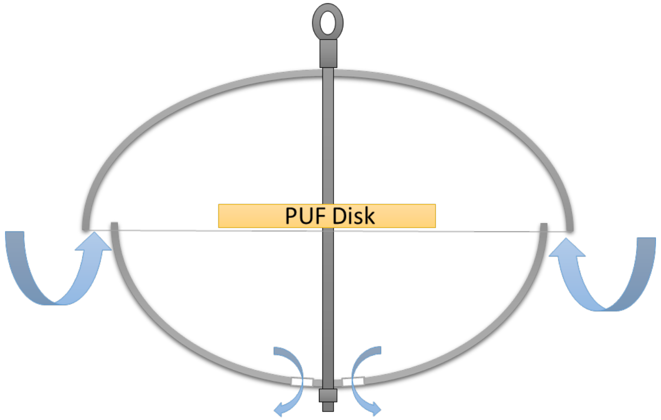
https://iowasuperfund.uiowa.edu/


Administrative Core
Data Management & Analysis Core
Synthesis Core
Analytical Core
PROJECT 1
Airborne PCBs and their Metabolites: Risk Factors for Adverse Neurodevelopmental Outcomes in Adolescence
PROJECT 2
The role of Airborne PCBs in Adipogenesis, Adipose Function, and Metabolic syndrome
PROJECT 3
Airborne Exposures to Semi-volatile Organic Pollutants (The AESOP Study)
PROJECT 4
Sources of Airborne PCB Congeners
PROJECT 5
Mitigating Airborne PCB emissions from sediments with black carbon materials and PCB-degrading biofilms
P1
P2
P3
P4
P5
Research Experience and Training Coordination Core
Community Engagement Core
Cln
Clm
HO



ISRP ANALYTICAL CORE

MY FAVORITE AIR SAMPLER IS THE PUF-PAS
IT CAPTURES THE ENTIRE SUITE OF PCB CONGENERS IN AIR



But what is the volume of air collected by a passive sampler?

EFFECTIVE VOLUME FOR PCBS COLLECTED WITH PUF-PAS

Effective air volume is congener-specific

OUTDOORS:

Persoon, C.; Hornbuckle, K. C., Calculation of passive sampling rates from both native PCBs and depuration compounds in indoor and outdoor environments. *Chemosphere* 2009, 74, (7), 917-923. https://doi.org/10.1016/j.chemosphere.2008.10.011

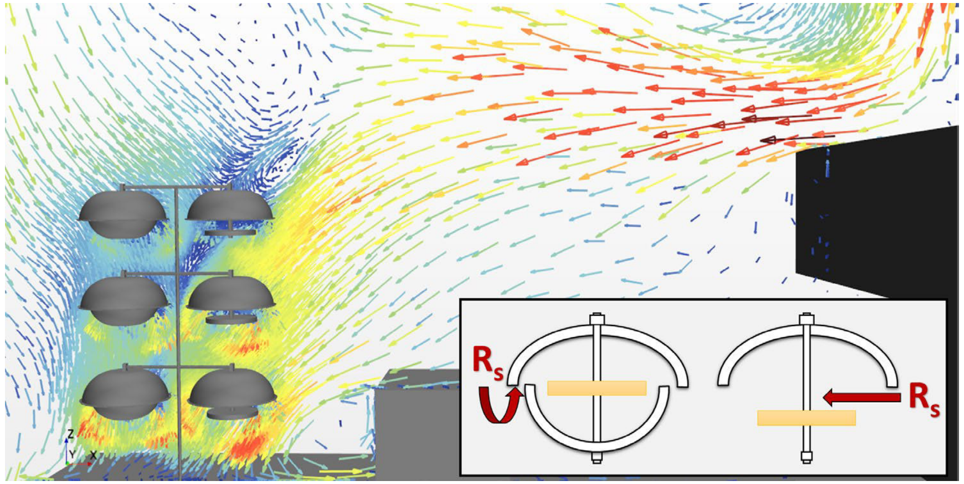
Petrich, N. T., Spak, S. N., Carmichael, G. R., Hu, D., Martinez, A., Hornbuckle, K. C. (In Press) Simulating and explaining passive air sampling rates for semi-volatile compounds on polyurethane foam passive samplers. July 25, 2013 *Environmental Science & Technology*. https://doi.org/10.1021/es401532q

Herkert, Nicholas J, Martinez, Andres, Hornbuckle, Keri C, A Model Using Local Weather Data to Determine the Effective Sampling Volume for PCB Congeners Collected on Passive Air Samplers. *Environmental Science & Technology*, 2016 July, 50:6690-7. https://doi.org/10.1021/acs.est.6b00319

Herkert, N.J., S.N. Spak, A. Smith, J.K. Schuster, T. Harner, A. Martinez, and K.C. Hornbuckle, Calibration and evaluation of PUF-PAS sampling rates across the Global Atmospheric Passive Sampling (GAPS) network. *Environmental Science: Processes & Impacts*, 2018. 20(1): p. 210-219. https://doi.org/10.1039/c7em00360a

https://pufpasvolume.org/

INDOORS:



Herkert, N.J. and K.C. Hornbuckle, Effects of room airflow on accurate determination of PUF-PAS sampling rates in the indoor environment. *Environmental Science: Processes & Impacts*, 2018. 20(5): p. 757-766. https://doi.org/10.1039/c8em00082d

Environmental Science & Technology

Article

pubs.acs.org/est

Airborne PCBs and OH-PCBs Inside and Outside Urban and Rural U.S. Schools

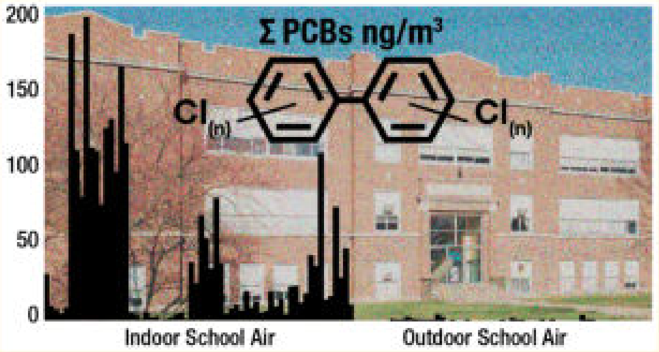
Rachel F. Marek,*[†] Peter S. Thorne,*[‡] Nicholas J. Herkert,[†,§] Andrew M. Awad,[†] and Keri C. Hornbuckle*[†,§]

[†]IIHR-Hydroscience and Engineering and [§]Department of Civil & Environmental Engineering, The University of Iowa, 103 South Capitol Street, 4105 SC, Iowa City, Iowa 52242, United States

[‡]Department of Occupational and Environmental Health, The University of Iowa, 100 CPHB, S341A, 145 N. Riverside Dr., Iowa City, Iowa 52242, United States

Supporting Information

ABSTRACT: PCBs appear in school air because many school buildings were built when PCBs were still intentionally added to building materials and because PCBs are also present through inadvertent production in modern pigment. This is of concern because children are especially vulnerable to the toxic effects of PCBs. Here we report indoor and outdoor air concentrations of PCBs and OH-PCBs from two rural schools and four urban schools, the latter near a PCB-contaminated waterway of Lake Michigan in the United States. Samples (n = 108) were collected as in/out pairs using polyurethane foam passive air samplers (PUF-PAS) from January 2012 to November 2015. Samples were analyzed using GC/MS-MS for all 209 PCBs and 72 OH-PCBs. Concentrations inside schools were 1−2 orders of magnitude higher than outdoors and ranged from 0.5 to 194 ng/m^3 (PCBs) and from 4 to 665 pg/m^3 (OH-PCBs). Congener profiles were similar within each sampling location across season but different between schools and indicated the sources as Aroclors from building materials and individual PCBs associated with modern pigment. This study is the first cohort-specific analysis to show that some children's PCB inhalation exposure may be equal to or higher than their exposure through diet.

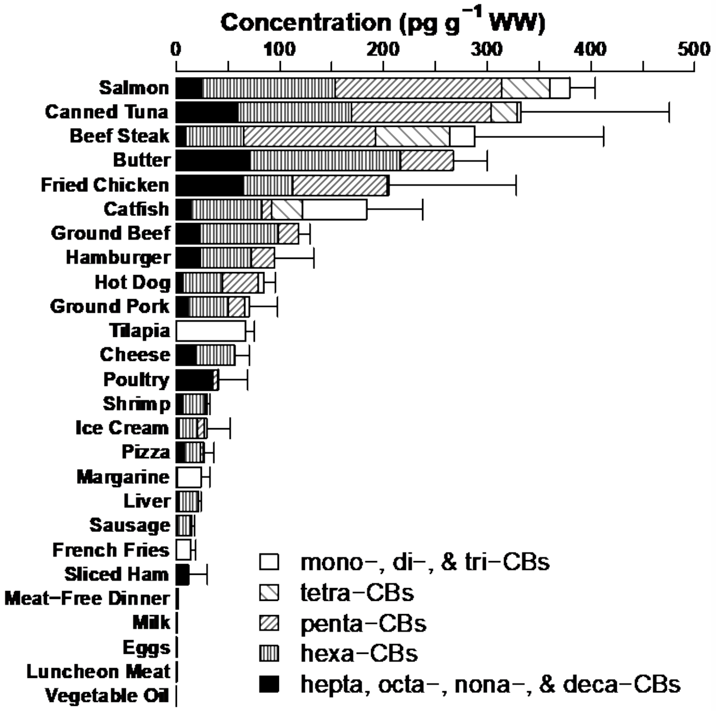


INTRODUCTION

been measured in people around the world including children.[2,26−29] Although OH-PCBs are recognized as

Environ. Sci. Technol. 2017

INHALATION IN SCHOOLS IS AS LARGE AS DIETARY EXPOSURE



Environmental Science & Technology

pubs.acs.org/est

Article

Polychlorinated Biphenyls in Food

Panithi Saktrakulkla, Tuo Lan, Jason Hua, Rachel F. Marek, Peter S. Thorne,* and Keri C. Hornbuckle*

Cite This: *Environ. Sci. Technol.* 2020, 54, 11443–11452

Read Online

ACCESS | Metrics & More | Article Recommendations | Supporting Information

ABSTRACT: We measured the concentrations of 205 polychlorinated biphenyl (PCB) congeners in 26 food items: beef steak, butter, canned tuna, catfish, cheese, eggs, french fries, fried chicken, ground beef, ground pork, hamburger, hot dog, ice cream, liver, luncheon meat, margarine, meat-free dinner, milk, pizza, poultry, salmon, sausage, shrimp, sliced ham, tilapia, and vegetable oil. Using Diet History Questionnaire II, we calculated the PCB dietary exposure in mothers and children participating in the AESOP Study in East Chicago, Indiana, and Columbus Junction, Iowa. Salmon had the highest concentration followed by canned tuna, but fish is a minor contributor to exposure. Other animal proteins are more important sources of PCB dietary exposure in this study population. Despite the inclusion of few congeners and food types in previous studies, we found evidence of a decline in PCB concentrations over the last 20 years. We also found strong associations of PCB congener distributions with Aroclors in most foods and found manufacturing byproduct PCBs, including PCB11, in tilapia and catfish. The reduction in PCB levels in food indicates that dietary exposure is comparable to PCB inhalation exposures reported for the same study population.

INTRODUCTION

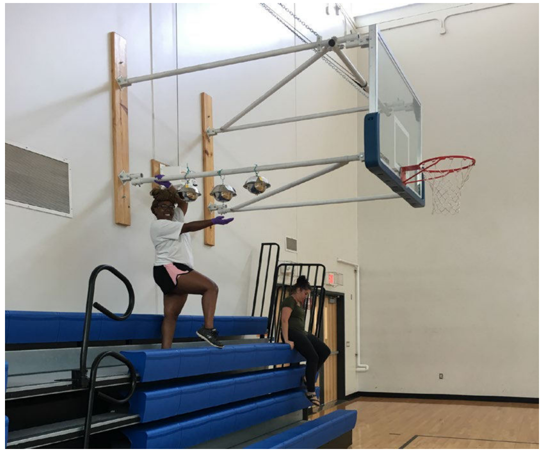
Food has long been considered the major source of polychlorinated biphenyl (PCB) exposure.[1,2] However, it is uncertain whether it is still true, particularly in the U.S. where commercial uses of PCBs have ceased for almost 50 years.[1,3,4] There are few studies reporting PCB levels in foods sold in the U.S, with the exception of seafood. While some of these studies manufacturing byproduct PCBs and the full extent PCB contamination in the environment and in food.

Here, we report one of the most comprehensive studies of PCBs in food since the 2000s. We measured 205 PCB congeners (represented as 171 chromatographic separations) in 26 food items purchased in a rural community in Iowa far from known significant PCB sources. We evaluated the trends of PCB levels in foods over the last 20 years and calculated the

Environ. Sci. Technol. 2020

https://youtu.be/rVUvoUVu7Uc

We used polyurethane foam passive air samplers to measure airborne PCBs in nine classrooms in one school



Environmental Science & Technology

pubs.acs.org/est

Article

Room-to-Room Variability of Airborne Polychlorinated Biphenyls in Schools and the Application of Air Sampling for Targeted Source Evaluation

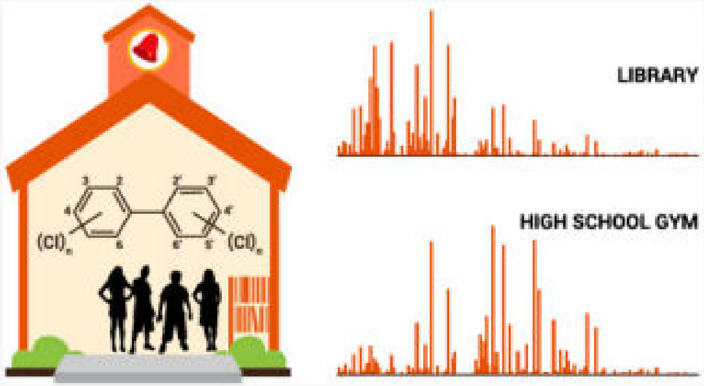
Moala K. Bannavti,[†] Jacob C. Jahnke,[†] Rachel F. Marek, Craig L. Just, and Keri C. Hornbuckle*

Cite This: *Environ. Sci. Technol.* 2021, 55, 9460–9468

Read Online

ACCESS | Metrics & More | Article Recommendations | Supporting Information

ABSTRACT: Airborne polychlorinated biphenyl (PCB) concentrations are higher indoors than outdoors due to their historical use in building materials and their presence in modern paints and surface treatments. For some populations, including school children, PCB levels indoors result in inhalation exposures that may be greater than or equivalent to exposure through diet. In a school, PCB exposure may come from multiple sources. We hypothesized that there are both Aroclor and non-Aroclor sources within a single school and that PCB concentration and congener profiles differ among rooms within a single building. To evaluate this hypothesis and to identify potential localized sources, we measured airborne PCBs in nine rooms in a school. We found that schoolroom concentrations exceed outdoor air concentrations.

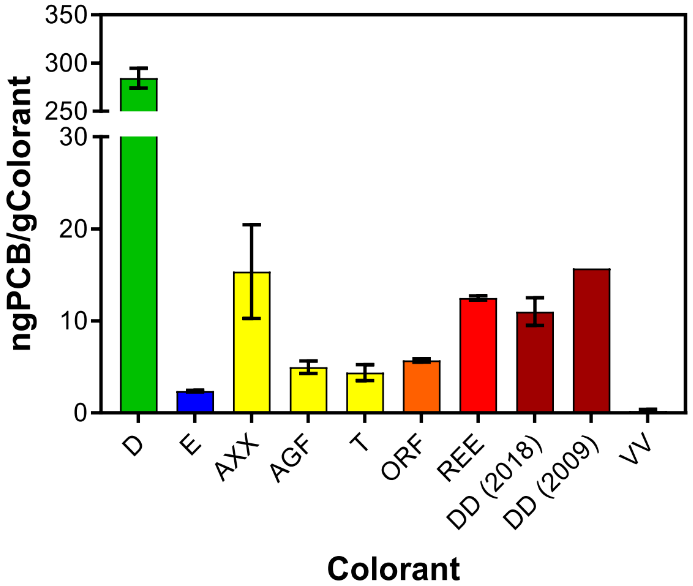


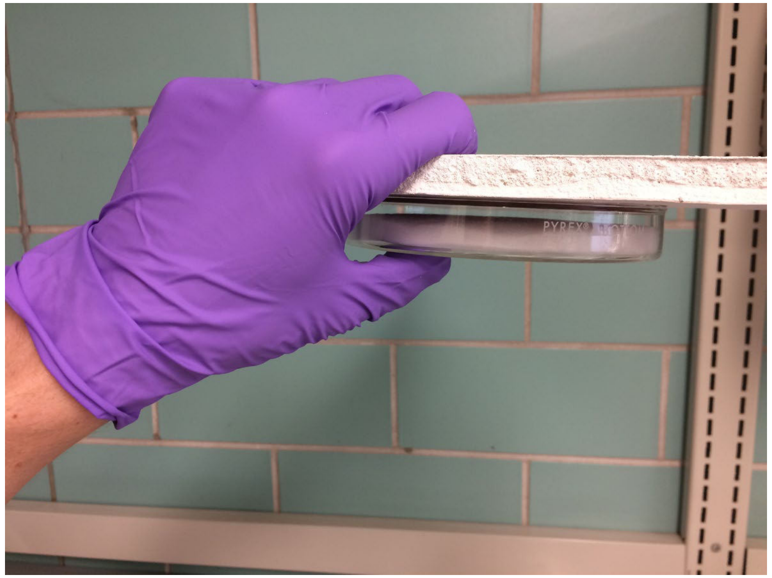
Schoolroom concentrations and congener profiles also varied from one room to another. The concentrations were highest in the math room (35.75 ng m^{-3} ± 8.08) and lowest in the practice gym (1.54 ng m^{-3} ± 0.35). Rooms in the oldest wing of the building, originally constructed between 1920 and 1970, had the highest concentrations. The congener distribution patterns indicate historic use of Aroclor 1254 as well as modern sources of non-Aroclor congeners associated with paint pigments and surface coatings. Our findings suggest this noninvasive source identification method presents an opportunity for targeted source testing for more cost-effective prioritization of materials remediation in schools.

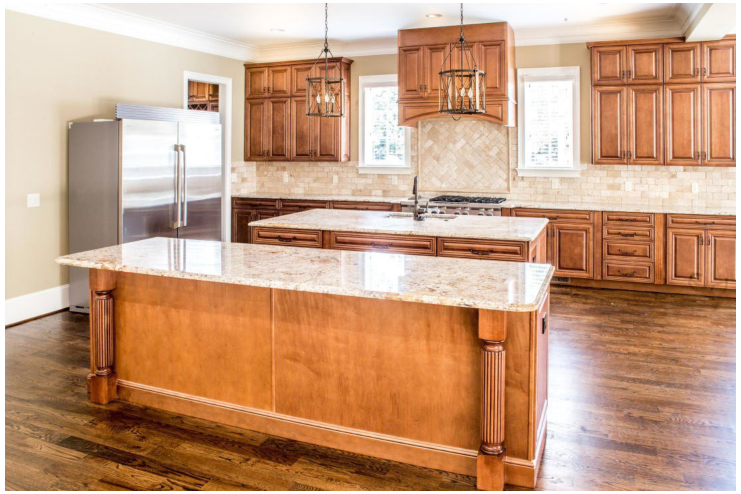
KEYWORDS: *polychlorinated biphenyls, atmospheric chemistry, gas chromatography mass spectrometry, positive matrix factorization, principal component analysis, Aroclor, non-Aroclor*

Environ. Sci. Technol. 2021

We invented the Polyurethane Foam Passive Emission Sampler (PUF-PES) to study emissions of PCBs from building materials







Jahnke, J.C. and K.C. Hornbuckle, **PCB emissions from paint colorants**. *Environmental Science & Technology*, 2019, 53 (9), pp 5187–5194, https://doi.org/10.1021/acs.est.9b01087

Herkert, N.J., J.C. Jahnke, and K.C. Hornbuckle, **Emissions of Tetrachlorobiphenyls (PCBs 47, 51, and 68) from Polymer Resin on Kitchen Cabinets as a Non-Aroclor Source to Residential Air.** *Environmental Science & Technology*, 2018. 52(9): p. 5154-5160. https://doi.org/10.1021/acs.est.8b00966

Environmental Science & Technology LETTERS

Open Access

This article is licensed under CC-BY 4.0

pubs.acs.org/journal/estlcu

Letter

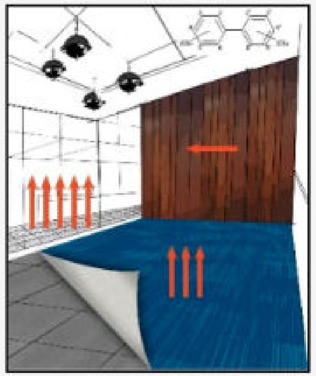
Congener-Specific Emissions from Floors and Walls Characterize Indoor Airborne Polychlorinated Biphenyls

Moala K. Bannavti, Rachel F. Marek, Craig L. Just, and Keri C. Hornbuckle*

Cite This: *Environ. Sci. Technol. Lett.* 2023, 10, 762−767

Read Online

ACCESS | Metrics & More | Article Recommendations | Supporting Information



ABSTRACT: To reconcile the federal regulation of material polychlorinated biphenyl (PCB) concentrations with recently implemented state regulations of airborne PCBs, there is a need to characterize the relationship between PCB emissions from surfaces and air concentrations. We hypothesized that the magnitude and congener distribution of emissions from floors and walls fully account for the airborne PCBs measured in rooms constructed during the height of PCB production and sales. We measured emissions of PCB congeners from various wall and floor materials using polyurethane foam passive emission samplers before and after hexane wiping. Our results revealed that PCB emissions from flooring adequately predicted the magnitude and congener distribution of PCBs observed in the room air. Emissions varied by material within a single building (5×10^3 ng m^{-2} day^{-1} from wood panel walls to 3×10^4 ng m^{-2} day^{-1} from vinyl tile) and within the same room. Yet congener distributions between material emission PCB profiles and room air PCB profiles were statistically similar. Hexane wiping significantly reduced PCB emissions (>60%), indicating the importance of surface films as an ongoing source of airborne PCBs. The magnitude and congener distribution of material bulk concentrations did not explain that of material emissions or air concentrations. Passive measurements of polychlorinated biphenyl emissions from floors in a university building predict the concentrations of PCBs in room air.

KEYWORDS: *Atmospheric chemistry, Polychlorinated biphenyls, Gas chromatography mass spectrometry, Emissions, Materials, Aroclors*

■ INTRODUCTION

Gas-phase emissions of polychlorinated biphenyls (PCBs) from PCB-containing building materials are sources of indoor

PCBs to room air. Multiple materials can be PCB sources and sinks in a room, and an accurate inventory of associated emission sources can inform targeted remediation strategies.

Environ. Sci. Technol. 2023

The EPA currently does not have regulations for airborne PCBs in schools. But Vermont does.

Exposure Levels for Evaluating PCBs in School Indoor Air (ng/m3)*

Age: 1-<2 yr	Age: 2-<3 yr	Age: 3-<6 yr	Age: 6-<12 yr elementary school	Age: 12-15< yr middle school	Age: 15-<19 yr high school	Age: 19+ yr adult
100	100	200	300	500	600	500

US. EPA

In 2021, the Vermont legislature required that by 2024 all schools built or renovated prior to 1980 be tested for polychlorinated biphenyls (PCBs) in the indoor air. The Vermont Department of Health (Health) developed school action levels (SALs) to prioritize action when PCBs are found in school indoor air. PCB levels in the indoor air of schools should be kept as low as possible.

The school action levels are:

- 30 ng/m^3 (nanograms per cubic meter) for pre-kindergarten
- 60 ng/m^3 for kindergarten through 6th grade
- 100 ng/m^3 for 7th through 12th grades

State of Vermont, Feb, 2022

University of Iowa sampling timeline

VERMONT

2020
Burlington High School shut down due to PCBs

2021
Vermont: new PCB action levels and passes law to <u>measure airborne PCBs in pre-1980 schools</u>

2022
University of Iowa team begins sampling VT schools

2023
19 schools and ~500 samples

IOWA

Environmental Science & Technology

Open Access

This article is licensed under CC-BY 4.0

pubs.acs.org/est

Article

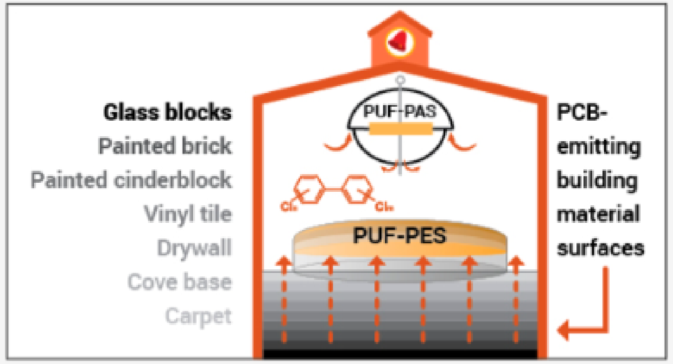
Polyurethane Foam Emission Samplers to Identify Sources of Airborne Polychlorinated Biphenyls from Glass-Block Windows and Other Room Surfaces in a Vermont School

Jason B. X. Hua, Rachel F. Marek, and Keri C. Hornbuckle*

Cite This: *Environ. Sci. Technol.* 2023, 57, 14310–14318

Read Online

ACCESS | Metrics & More | Article Recommendations | Supporting Information

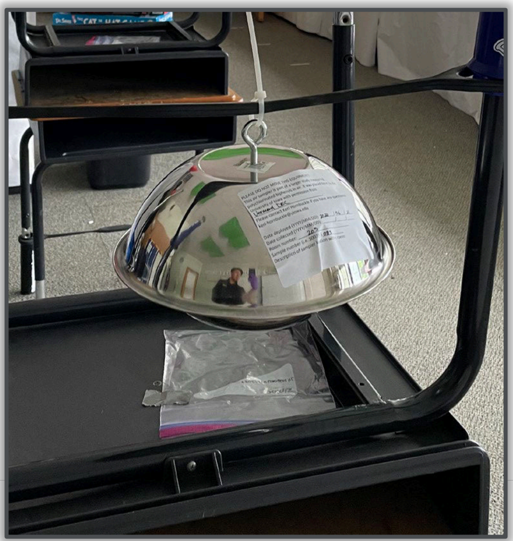


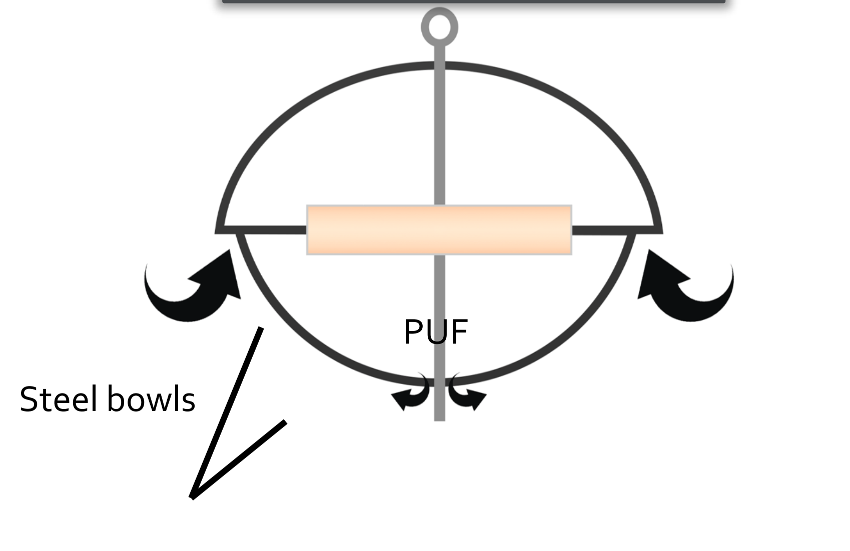
ABSTRACT: We hypothesized that emissions of polychlorinated biphenyls (PCBs) from Aroclor mixtures present in building materials explain their concentrations in school air. Here, we report a study of airborne concentrations and gas-phase emissions in three elementary school rooms constructed in 1958. We collected airborne PCBs using polyurethane foam passive air samplers (PUF-PAS, n = 6) and PCB emissions from building materials using polyurethane foam passive emission samplers (PUF-PES, n = 17) placed over flat surfaces in school rooms, including vinyl tile floors, carpets, painted bricks, painted drywall, and glass-block windows. We analyzed all 209 congeners represented in 173 chromatographic separations and found that the congener distribution in PUF-PES strongly resembled the predicted diffusive release of gas-phase PCBs from a solid material containing Aroclor 1254. Concentrations of airborne total PCBs ranged from 38 to 180 ng m^{-3}, a range confirmed by an independent laboratory in the same school. These levels exceed action levels for all aged children set by the State of Vermont and exceed guidance levels set by the U.S. EPA for children under age 3. Emissions of PCBs from the glass-block windows (30,000 ng m^{-2} d^{-1}) greatly exceeded those of all other surfaces, which ranged from 35 to 2700 ng m^{-2} d^{-1}. This study illustrates the benefit of the direct measurement of PCB emissions to identify the most important building remediation needed to reduce airborne PCB concentrations in schools.

KEYWORDS: *PUF-PES, semivolatile organic compounds, persistent organic pollutants, legacy compounds*

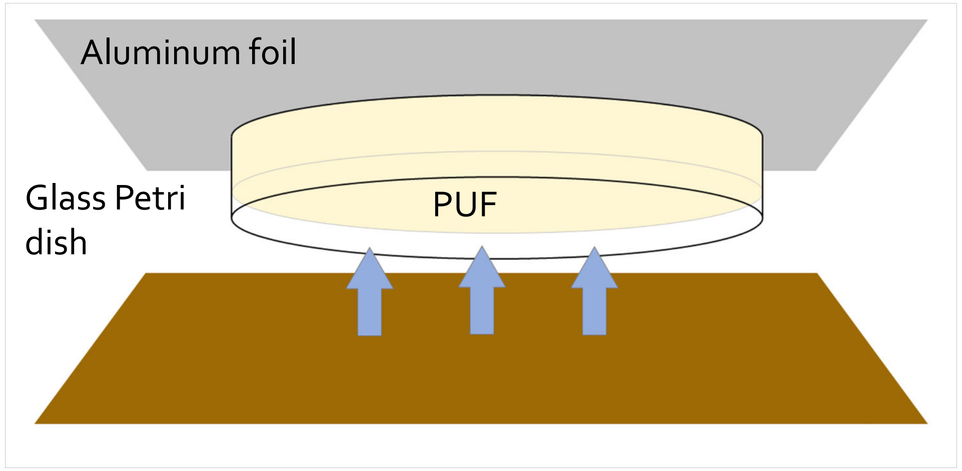
Environ. Sci. Technol. 2023

Polyurethane foam passive air sampler (PUF-PAS)





Polyurethane foam passive emission sampler (PUF-PES)



IOWA

Protocol for collecting and reporting Vermont school PCB data

1. Review previous reports from Vermont consultants and laboratories
2. Place PUF-PAS and PUF-PES in school. Retrieve ~ month later
3. Analyze for all 209 PCBs by GC/MS/MS
4. Report preliminary findings – generally qualitative
5. Report draft full report
6. Provide full report, including data to Vermont, alert schools of its availability

Preliminary Results from Polyurethane Foam Passive Emission Samples (PUF-PES)

Rank	Surface
1	Glass blocks
2	Brick wall
3	Cinderblock wall
4	Floor tile
5	Dry wall
6	Cove base
7	Carpet

1: Glass blocks

2: Brick wall

3: Cinderblock wall

4: Floor tile

5: Dry wall

6: Cove Base

7: Carpet

Full Report: Written and Data

Executive Summary

The purpose of this document is to present results of PCB analyses of Oak Grove School, Brattleboro, Vermont. According the Vermont DEC, the rooms sampled (201, 203, 205) were constructed in 1958.

The University of Iowa team, in collaboration with Vermont and school officials, deployed 6 polyurethane foam passive air samplers (PUF-PAS), 17 polyurethane foam passive emission samplers (PUF-PES), and 3 field blanks across 3 rooms in Oak Grove School (OG) for 34 days, from June 21, 2022, to July 25, 2022 (Table 1).

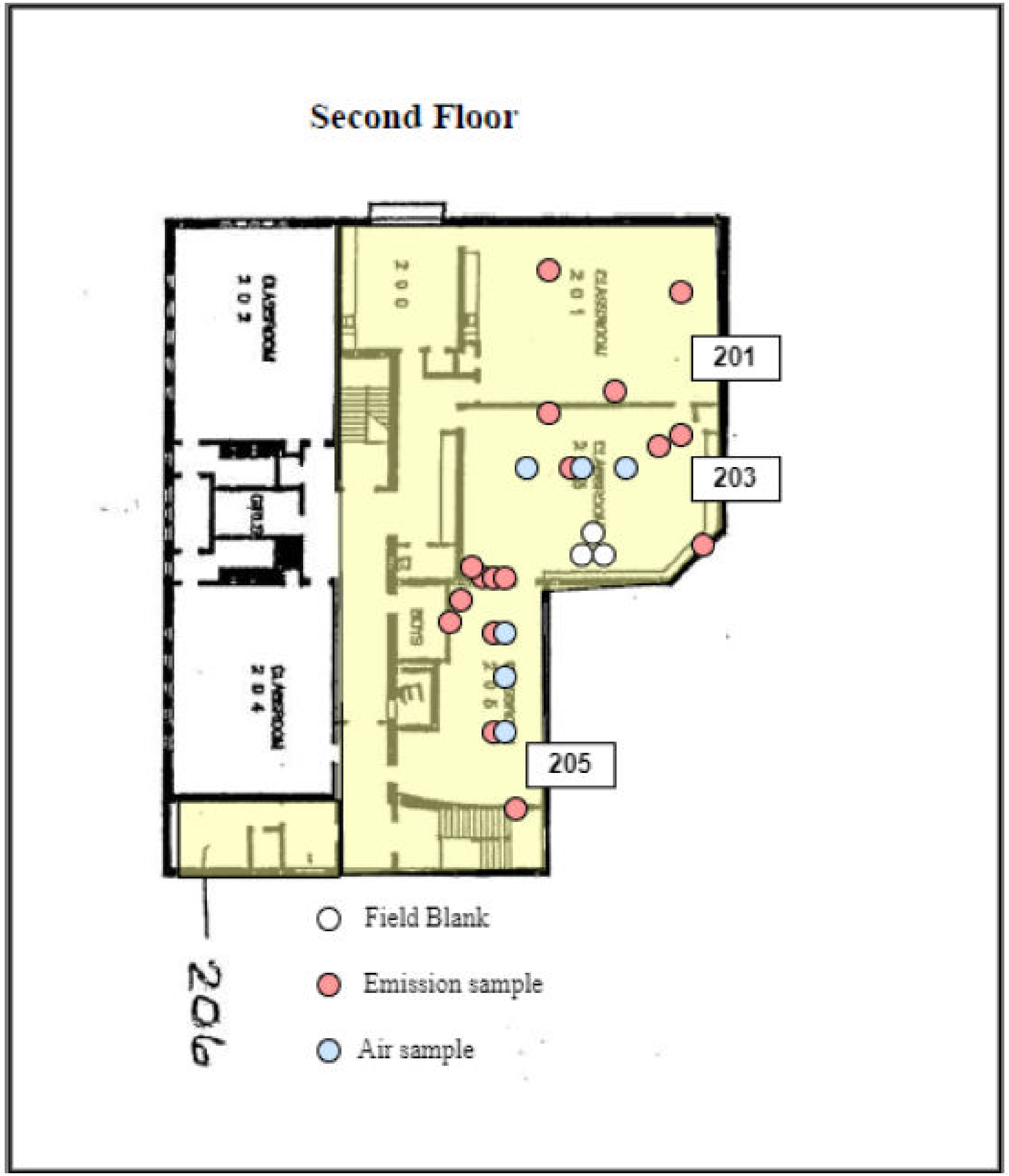
Methods used for this study are research methods previously reported (Bannavti, Jahnke et al., 2021; Herkert et al 2018). Briefly, samples, field blanks, and laboratory blanks were extracted with acetone and hexane, purified and concentrated, and then analyzed using a gas chromatograph with triple quadrupole mass spectrometry. The method produces mass (ng) values for all 209 possible PCB congeners minus one congener (PCB 204) used for quality control purposes. Some PCBs cannot be individually separated, and the method reports congener results as 173 congeners or coeluting congeners. Quality assurance and control protocols address accuracy, precision, representativeness, reproducibility and comparability.

Table 1: Summary of samples analyzed for Oak Grove School.

Batch (BID)	Sample ID (SID)	Sample Type	Room Number	Material Sampled
OG01	S065	Air	205	Air
OG02	S085	Emissions	205	Carpet
OG03	S087	Emissions	205	Carpet
OG04	S074	Emissions	203	Carpet
OG05	S061	Emissions	203	Dry Wall
OG06	S062	Emissions	203	Carpet
OG07	S075	Emissions	201	Carpet
OG08	S084	Emissions	205	Dry Wall
OG09	S086	Emissions	205	Cinderblock Wall
OG10	S088	Emissions	205	Carpet
OG11	S063	Air	205	Air
OG12	S067	Emissions	203	Covebase
OG13	S069	Air	203	Air
OG14	S070	Air	203	Air
OG15	S076	Emissions	203	Glass Blocks
OG16	S077	Emissions	201	Carpet
OG17	S083	Air	205	Air
OG18	S064	Emissions	203	Carpet
OG19	S066	Emissions	203	Tile
OG20	S068	Emissions	203	Cinderblock Wall
OG21	S071	Emissions	203	Brick Wall
OG22	S072	Air	203	Air
OG23	S082	Emissions	201	Carpet
OGB1	S079	Field Blank	203	Blank
OGB2	S078	Field Blank	203	Blank
OGB3	S073	Field Blank	203	Blank
LB01	S309	Lab Blank	SC1246	Blank
LB02	S308	Lab Blank	SC1246	Blank
LB03	S276	Lab Blank	SC1246	Blank
LB04	S277	Lab Blank	SC1246	Blank

Full Report: Written and Data

Sampler Deployment Locations



Full Report: Written and Data

Sample Summary

Concentrations and emissions of airborne PCBs are determined for each congener or coeluting congener group. Table 4 provides the sum of the congener air concentrations ($ng\ m^{-3}$) or emissions ($ng\ m^{-2}\ day^{-1}$). Individual congener air concentrations and emissions are provided in a separate database. Air concentrations are calculated as the sum of each congener's mass divided by the respective V_{eff} (Table 3). Emissions are calculated as the total mass divided by the PUF surface area (0.0153 m^2) divided by the deployment time (34 days). Emission samplers may underestimate actual emissions because it may become saturated at high loadings. Table 5 reports air concentration and emissions equivalent results for lab blanks and field blanks. More details are provided in the "Laboratory Blanks and Field Blanks" section. Air samples and most emission samples were well above the values measured in the blanks. Carpet samples in room 203 were near detection limits based on field blank measurements.

Table 4: Summary of air concentrations (ng m^{-3}) and emissions (ng m^{-2} d^{-1}) of materials.

Room Number	Material	Air Concentration	Emissions
201	Carpet		300
201	Carpet		280
201	Carpet		270
203	Air	180	
203	Air	150	
203	Air	96	
203	Glass Blocks		30,000
203	Brick Wall		2,700
203	Cinderblock Wall		1,700
203	Tile		1,400
203	Dry Wall		1,100
203	Covebase		510
203	Carpet		40
203	Carpet		35
203	Carpet		35
205	Air	51	
205	Air	41	
205	Air	38	
205	Cinderblock Wall		560
205	Dry Wall		480
205	Carpet		410
205	Carpet		360
205	Carpet		220

Full Report: Written and Data

Table 5: Summary of blank measurements as air concentrations (ng m^{-3}) and emissions (ng m^{-2} d^{-1}) for Oak Grove School.

Room Number	Material	Air Concentration	Emissions
SC1246	Lab Blank	0.09	5
SC1246	Lab Blank	0.10	5
SC1246	Lab Blank	0.26	10
SC1246	Lab Blank	0.14	8
203	Field Blank	0.42	20
203	Field Blank	0.08	5
203	Field Blank	0.17	9

Surrogate Standard Recoveries

We use ten, 13C PCBs as surrogate standards: 13C 3, 5, 15, 28, 52, 118, 153, 180, 194, 209. Known masses of surrogate standards are spiked into samples to allow for correction due to analytical losses during the extraction process. This also accounts for variability in each sample.

Table 8: Surrogate standard recoveries as percentages for each sample.

BID	13C 3	13C 5	13C 15	13C 28	13C 52	13C 118	13C 153	13C 180	13C 194	13C 209
LB01	36	69	75	80	102	88	87	86	88	87
OGB1	52	69	73	78	78	79	81	81	81	81
OG01	51	76	78	88	84	84	81	78	78	77
OG02	62	76	76	83	80	81	79	80	77	79
OG03	50	73	76	83	82	80	79	77	76	77
OG04	71	81	78	81	80	85	85	81	81	80
LB02	64	72	75	78	83	82	84	85	83	84
OGB2	70	77	79	80	87	81	80	78	78	77
OG05	63	77	81	85	87	88	84	81	79	79
OG06	64	73	72	74	72	83	83	86	84	86
OG07	65	73	76	80	83	79	80	76	74	75
OG08	63	70	73	77	78	78	78	77	77	79

Full Report: Written and Data

ReadMe.txt

```
This ReadMe.txt file was generated on 2023-05-24 by Jason Hua &
Last updated: 2023-06-08 by Jason Hua & Trevor Erb

-----------------------------------------
GENERAL INFORMATION
-----------------------------------------


This folder contains PCB data in supplement to the final report

-----------------------------------------
DATA DICTIONARY
-----------------------------------------


PCB: Polychlorinated biphenyl
SC: Seamans Center
PUF: polyurethane foam
PAS: passive air sampler
PES: passive emission sampler
bid: batch identification
sid: sample identification
S: sample
LB: lab blank
ss: Surrogate Standard
is: Internal Standard
unc: uncorrected
ng: nanogram
mL: mililiter
μL: microliter
LOQ: Limit of Quantification
coc: chain of custody

-----------------------------------------
FOLDER NAME: Pictures
-----------------------------------------

This folder contains pictures taken during sampler deployment
```

og_emissions

Search Excel

File Home Insert Draw Page Layout Formulas Data Review View Automate Help

A35

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	bid	1	2	3	4	5	6	7	8	9	10	11	12+13	14
2	OG02	0.712276	0.205881	0.797741	1.345664	0.140747	0.970772	0.2549	4.313716	0.30248	0.068713	13.22091	0.359764	0.001449
3	OG03	0.949076	0.225839	0.925579	1.413908	0.178648	1.036769	0.26435	4.688926	0.334289	0.086156	20.91519	0.579818	0.001514
4	OG04	1.661226	0.155381	0.503086	1.401574	0.065685	0.361349	0.112955	1.293535	0.156371	0.083697	1.641246	0.086145	0.000439
5	OG05	1.381301	0.291409	1.227618	2.247898	0.270388	1.530028	0.353537	6.586073	0.470225	0.14231	20.24515	0.884609	0.026706
6	OG06	1.690336	0.182408	0.527985	1.461549	0.068333	0.37547	0.112982	1.391698	0.165345	0.093818	2.341131	0.094971	0.012241
7	OG07	1.582759	0.293149	1.100973	2.690339	0.23366	1.405581	0.361335	6.018265	0.56283	0.156733	17.13607	0.454995	0.000983
8	OG08	0.568033	0.170473	0.619533	1.260121	0.204677	1.022156	0.24392	4.377826	0.314394	0.05732	17.83861	0.455107	0.002493
9	OG09	0.76141	0.181404	0.696727	1.29778	0.202045	1.036438	0.256321	4.805881	0.326636	0.074798	19.36717	0.505862	0.004862
10	OG10	1.085597	0.318018	1.13484	1.981936	0.232911	1.438128	0.337152	6.506247	0.48083	0.114713	24.64979	0.635372	0.068765
11	OG12	3.281029	0.553698	2.136047	6.28283	0.418422	2.617898	0.661758	10.10175	0.947776	0.368837	14.21293	0.692132	0.000693
12	OG15	22.64855	2.719021	13.8058	8.030423	0.631476	3.531556	1.245982	11.45972	1.479302	0.522862	2.710517	1.824443	0.002885
13	OG16	1.864681	0.346187	1.236773	2.811387	0.224263	1.438191	0.357851	6.276892	0.550268	0.153066	17.23834	0.4498	0.039329
14	OG18	1.728895	0										057646	0.010942
15	OG19	0.762096	0										602987	0.007395
16	OG20	2.100658	0										.90586	0.008089
17	OG21	2.251568	0										332846	0.012357
18	OG23	1.262662	0										405721	0.043639
19														

DATASET | OPEN ACCESS

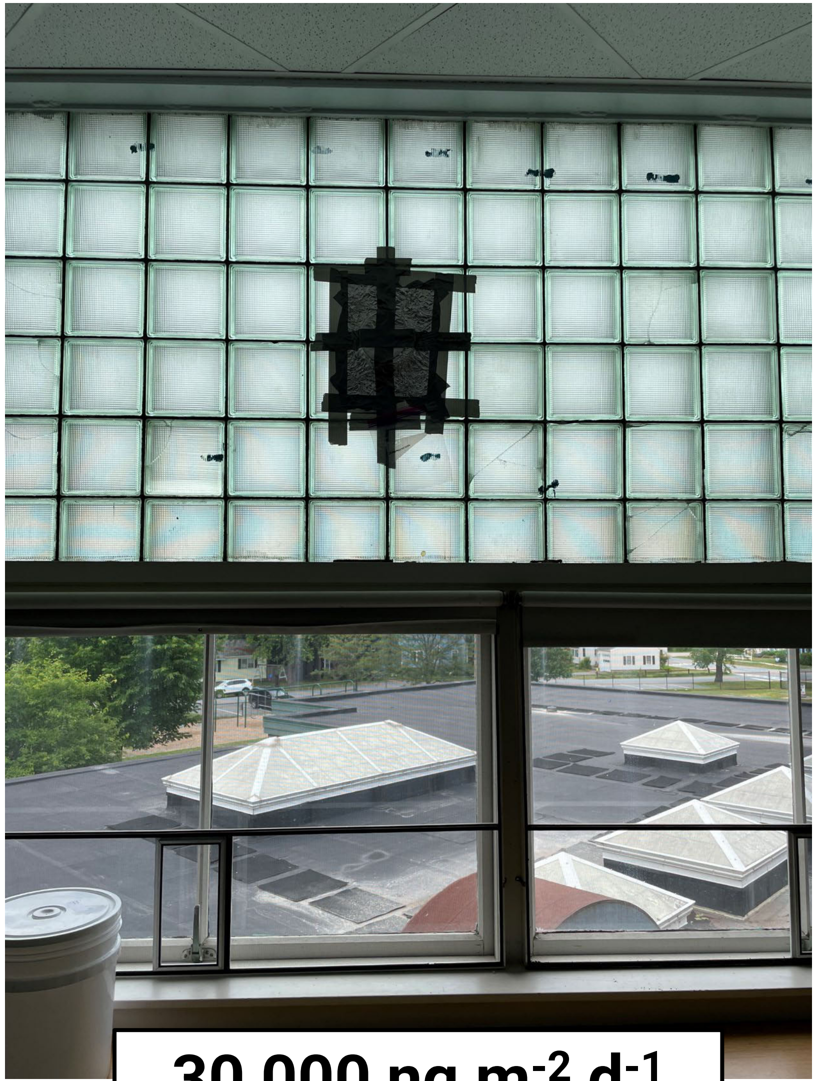
Dataset for Polyurethane Foam Emission Samplers to Identify Sources of Airborne Polychlorinated Biphenyls (PCBs) from Glass Block Windows and Other Room Surfaces in a Vermont School

Jason Hua, Keri C Hornbuckle and Rachel F Marek

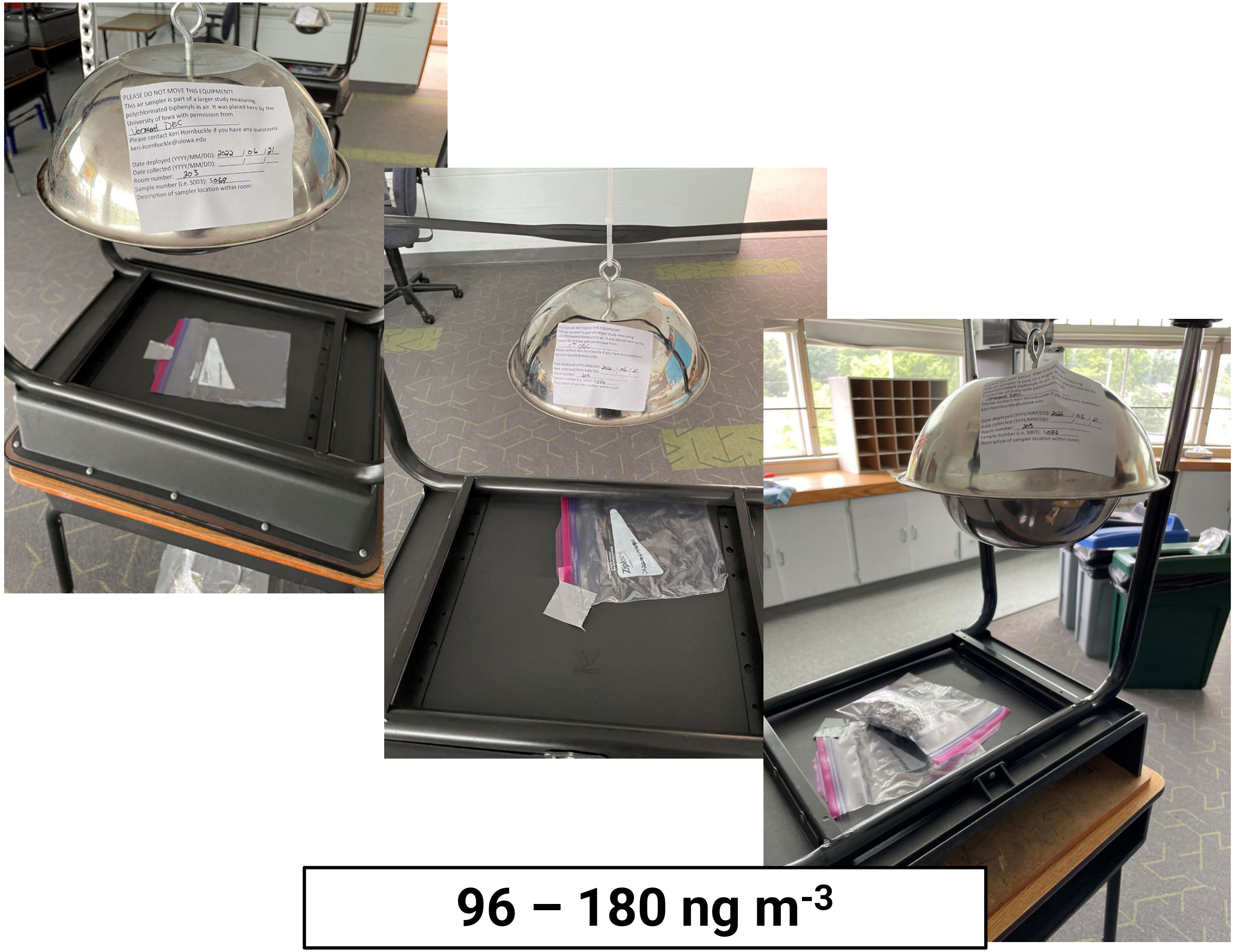
University of Iowa

DOI: 10.25820/data.006632

View Share Export



30,000 ng m^{-2} d^{-1}



96 – 180 ng m^{-3}

IOWA

Congener emissions are a function of volatility

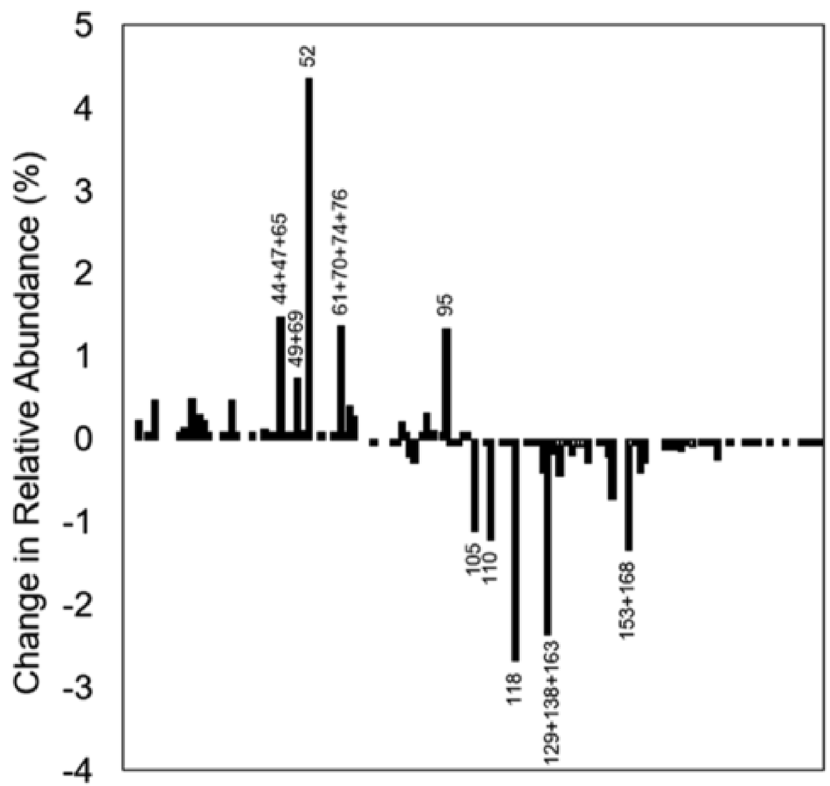
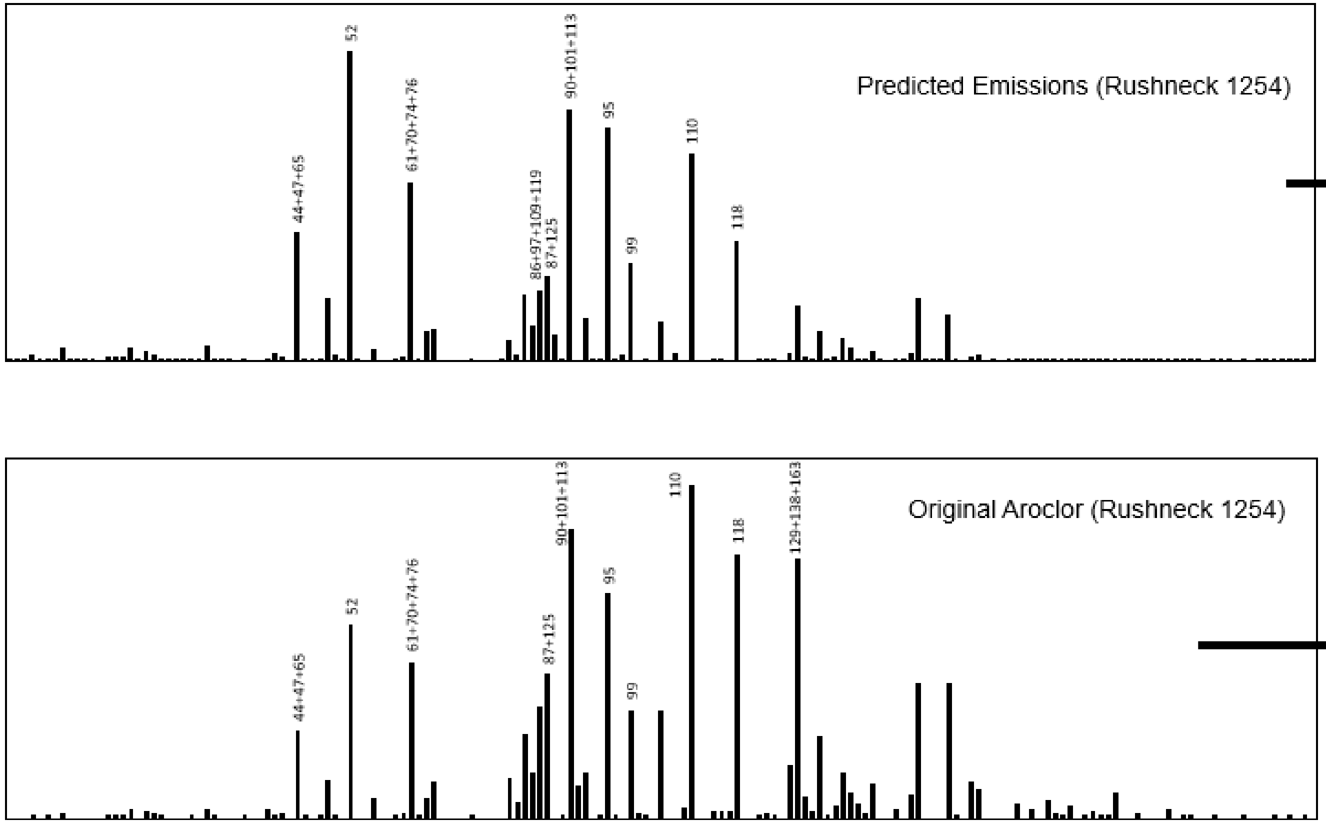
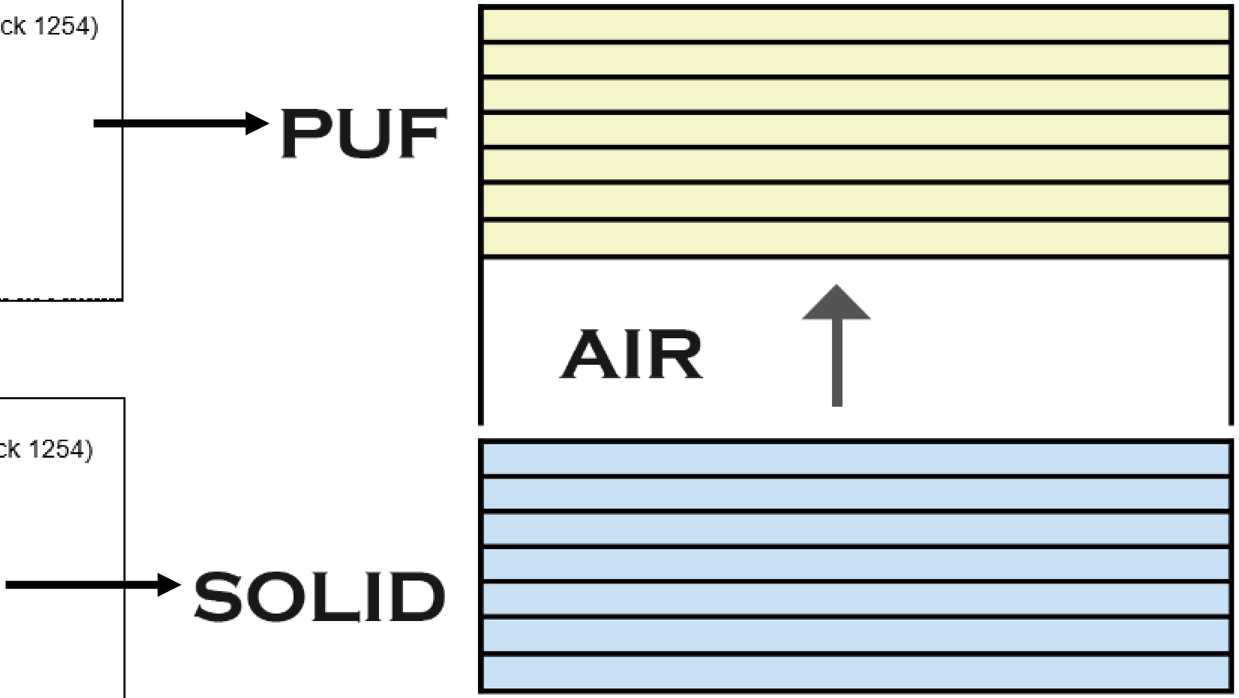


Figure 4. Percent difference between the emissions measured in this study and Aroclor 1254 (Rushneck, 2004), reported by congener. The emission rate is higher for the lower-molecular-mass congeners. This is due to the physical-chemical characteristics of the congeners, including diffusivity in the solid and the solid/air equilibrium concentration ratio. The congener order is from the lowest to the highest molecular mass, as listed in the Supporting Information. Ten congeners with the highest absolute differences are labeled.

IOWA

Emissions from glass blocks is due to Aroclor 1254





Congener similarity evaluated using cosine theta

	Air	Carpet	Carpet	Carpet	Dry Wall	Carpet	Carpet	Dry Wall	CMU Wall	Carpet	Air	Cove base	Air	Air	Glass Blocks	Carpet	Air	Carpet	Tile	CMU Wall	Brick Wall	Air	Carpet
R1221	0.01	0.02	0.02	0.21	0.01	0.19	0.03	0.01	0.01	0.02	0.01	0.03	0.01	0.01	0.01	0.03	0.01	0.21	0.00	0.01	0.01	0.01	0.02
R1232	0.19	0.31	0.24	0.46	0.21	0.43	0.28	0.21	0.21	0.25	0.19	0.25	0.18	0.18	0.13	0.29	0.19	0.43	0.17	0.18	0.19	0.17	0.26
R1016	0.27	0.45	0.35	0.45	0.29	0.44	0.39	0.30	0.30	0.36	0.27	0.35	0.25	0.25	0.12	0.41	0.27	0.43	0.24	0.25	0.26	0.23	0.38
R1242	0.37	0.53	0.44	0.51	0.41	0.50	0.46	0.40	0.41	0.46	0.37	0.42	0.36	0.36	0.27	0.49	0.37	0.48	0.36	0.36	0.38	0.35	0.46
R1248	0.60	0.67	0.64	0.60	0.66	0.60	0.62	0.62	0.64	0.64	0.60	0.60	0.61	0.60	0.53	0.65	0.59	0.60	0.62	0.62	0.63	0.59	0.63
R1254	0.76	0.64	0.67	0.60	0.76	0.60	0.61	0.71	0.73	0.69	0.75	0.62	0.79	0.79	0.83	0.62	0.75	0.59	0.75	0.77	0.77	0.80	0.63
m1254	0.96	0.88	0.91	0.84	0.97	0.84	0.87	0.94	0.95	0.91	0.95	0.90	0.97	0.97	0.91	0.88	0.95	0.84	0.96	0.97	0.97	0.97	0.89
R1260	0.24	0.17	0.19	0.18	0.22	0.17	0.17	0.22	0.22	0.21	0.24	0.17	0.27	0.27	0.26	0.17	0.24	0.17	0.22	0.24	0.23	0.27	0.17
R1262	0.12	0.09	0.09	0.09	0.11	0.09	0.08	0.11	0.11	0.10	0.12	0.08	0.13	0.13	0.12	0.08	0.12	0.08	0.10	0.12	0.11	0.13	0.09
R1268	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Environmental Science & Technology
pubs.acs.org/est
Viewpoint

Common Misconceptions about PCBs Obscure the Crisis of Children's Exposure in School

Keri C. Hornbuckle*

Cite This: Environ. Sci. Technol. 2022, 56, 16544−16545
Read Online

ACCESS | Metrics & More | Article Recommendations

KEYWORDS: PCB congeners, emissions, schools, remediation, building materials, exposures

INTRODUCTION

Polychlorinated biphenyls make up a set of 209 environmental contaminants that have been subject to a great deal of attention for more than 50 years. They are perhaps the most famous of the Stockholm Convention's "Dirty Dozen" and the most widely recognized of the chemicals called "Legacy" or "Forever Chemicals". I have studied PCBs in the environment for more than 30 years, and recently, my collaborators and I have shown that PCBs in school air pose a clear health hazard to children and people who work in schools (Figure 1). We have found that

Figure 1. I identify eight commonly held misconceptions about polychlorinated biphenyls (PCBs). These misconceptions contribute to ongoing human exposures to airborne PCBs in schools.

many schools harbor surprisingly high levels of these toxic

unjust assault on health. In this article, I identify and debunk eight commonly held opinions about PCBs.

Misconception 1. Living near a PCB Superfund Site Is the Worst Case for Human Exposure. *Our research has shown that the worst case for human exposure is a school room.* We have measured airborne PCBs near some of the largest PCB-contaminated sites in the United States, including over the contaminated waters of Green Bay and the Indiana Harbor and Ship Canal in Lake Michigan, and at New Bedford Harbor in Massachusetts. We have also measured airborne PCBs throughout the Chicago metro area. The highest level we recorded was 38 ng/m^3, immediately adjacent to New Bedford Harbor, one of the largest PCB Superfund sites in the country, yet concentrations we measure in schools have exceeded this value. Our studies of schools indicate that concentrations are equal or higher in schools built or remodeled during the PCB era.[1−3] Because of the numbers of children affected, I now believe attending or working in these schools represents the worst case for human exposure.

Misconception 2. The Use of PCBs Is Banned. In the United States, PCBs were not banned from use. PCBs, including Monsanto's Aroclor mixtures, remain in the materials for which they were originally designed. They are still found in the transformers that hang from poles in our yards, and they still reside in buildings constructed during the PCB era between 1950 and 1980. One of the easiest of PCB building materials to remove is fluorescent light ballasts, but Aroclor PCBs were also added to the adhesives under floor tile, to masonry sealants, to

Conclusions:

1. Schools are a big PCB exposure scenario.
2. PCBs are not banned from use in schools.
3. PCBs in school air do not decrease if material is not removed.
4. Air is an important exposure route.
5. PCBs are not just carcinogens but also neurotoxins associated with ADHC.
6. PCB metabolites are important contributors to toxicity.
7. Lower molecular weight PCBs are not harmless.
8. The Superfund legislation (SARA) does not provide support for PCB removal in schools. Who will pay?

ISRP
IOWA SUPERFUND
RESEARCH PROGRAM

NIH National Institute of
Environmental Health Sciences
Superfund Research Program

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

VERMONT

NSF

PCB Testing in Vermont Schools

Trish Coppolino, Department of Environmental Conservation

What are PCBs?

- PCBs = polychlorinated biphenyls
- PCBs were manufactured between 1930 – 1979
  - During this time an estimated 1.5 billion pounds of these industrial chemicals were produced in the US
- Monsanto Corporation was the sole producer of PCBs in the US
  - Production was banned by EPA in 1979

Why Test for PCBs in Schools?

- PCBs were used in hundreds of industrial and commercial applications including: caulking, paint, fluorescent light ballasts, window glazing, ceiling tiles, spray-on fireproofing, floor finishes, mastics (glue or resin) and carbonless copy paper.
- Effects of PCB exposure to children can have the most health effects.
- Schools have become one of largest sources of PCB impacts to students and staff.
- PCBs were found at high levels when Burlington High School was tested as a part of a renovation (more on this).

Burlington High School

- August 17, 2020, Spill Team notified of a release of PAHs and PCBs (>50PPM) in soil above standards. PCBs attributed to building materials.
- August 19, 2020, Agencies request IA sampling….working through who has regulatory authority - EPA? VDH? DEC?
- September 1, 2020, approve workplan for IA sampling.
- September 9, 2020, preliminary data received.
- Indoor Air concentrations Range from ND-6,300 ng/m^3.
- September 10, 2020, all classes go remote.

* *Remember this was after all classes were remote from March 2019 to June 2020*

Burlington High Scrambles After Air Tests Detect Cancer-Causing Chemicals

By COURTNEY LAMDIN

Signs warning about PCBs at Burlington High School | COURTNEY LAMDIN © *SEVEN DAYS*

Vermont PCB History and Legislation

- H.439 (Act 74) (2021)
  - Legislation requires that all public, approved and recognized independent schools constructed or renovated before 1980 must conduct indoor air sampling for PCBs. DEC was provided $4.5 million fund the sampling. Change Definition of Release.
  - ***"Release" also means the intentional or unintentional action or omission resulting in the spilling, leaking, emission, or disposal of polychlorinated biphenyls (PCBs) from building materials in a building or structure.***

- H.747 (Act 78) (June 2023)
  - States that mitigation and remediation costs as part of the testing program are 100% reimbursable from AOE ($13M)

Vermont Team Partners and PCB support group started July 2021

- VT DEC
  - Nine project managers
- Health
  - Sarah Owen, Danielle Allen, Pamela Wadman
- VT AOE
  - Jill Briggs Campbell
- US EPA Region I
  - Kim Tisa (before retirement), Katherine Woodward, Dan Wainberg, Matthew Rigdon

How is Testing of Vermont Schools being Approached?

- Sampling, mitigation, and cleanup follows the existing process used by DEC for investigating and remediating contaminated properties for any hazardous material release. **This process has DEC oversight for all steps in the process.**
- Sampling at each school will be representative
- VDH derived Screening Levels, School Action Levels (SALs) and Immediate Action Levels (IALs) to prioritize the need for action when PCBs are detected
  - PCB levels in the indoor air of schools should be kept as low as possible
  - SALs indicate when schools need to identify and abate potential sources of PCBs inside their buildings
  - IALs indicate the need for immediate, emergency corrective actions to reduce exposure. In order of priority, these actions are:
    - Eliminating the use of rooms where samples exceed the IAL;
    - Limiting the amount of time the space is used; and then
    - Deploying mitigation measures to reduce PCB concentrations in indoor air.

The "Built" Program

VTDEC	Health	AOE
Hire Consultants/hold technical meetings	Develop School Action Levels (SAL)	Coordinate and help with school communications
Prepare Technical Documents/FAQs (team)	Develop Immediate Action Levels (IAL)	Reimburse Schools for work conducted
Build a PCB database (team)	Develop Occupancy Options for Schools	Use Pre-approved Env. Consultants (BGS)
VAEL	School Meetings (team)	
Contract with University of Iowa (funded by DEC/Health)	Develop Communication Letters (team)	
Regulatory Process/WPCE, etc		
Coordination with EPA (technical/MOA)		

School Action Levels

- School Action Levels Immediate Action Levels (ng/m^3)

	Pre-K	K-Grade 6	Grade 7 to Adult
School Action Level	30 ng/m3	60 ng/m3	100 ng/m3
Immediate Action Level	90 ng/m3	180 ng/m3	300 ng/m3

How the Program Works

1. Survey to schools
2. Prioritize schools and set sampling schedule
   https://dec.vermont.gov/sites/dec/files/wmp/Sites/schedule_website.pdf
3. Assign consultants and DEC staff to school districts/private schools

How the Program Works (cont)

4. Consultant:
   - Contacts school to schedule date/time for inventory
   - Submits WPCE to DEC to conduct inventory (DEC approves)
   - Conducts full building inventory of all spaces
   - Provides DEC with grouping of spaces and WPCE to conduct IA sampling (DEC approves)
   - Schedules IA sampling with school *school

How the Program Works (cont)

5. IA results received:
   - DEC reviews IA results, QC and upload
   - Upload notifies Health
   - Health evaluates data and provides occupancy options for school
   - Occupancy options letter sent to school
   - DEC/Health/AOE meet with school

How the Program Works (cont)

6. School:
   - Joint Letter/occupancy options letter received
     - 10 days to notify DEC what occupancy option they have selected
   - School send letter to community about findings
   - Data is public 10 days from receipt

How the Program Works (cont)

7. School:
   - School is responsible to hire consultant to identify source of PCBs
   - DEC reviews/Approves WPCE for SI/Cleanup
   - AOE reimburse schools for approved costs
8. DEC work towards SI/Cleanup
   - sample building materials that may contain PCBs
   - work towards cleanup in compliance with DEC/EPA

*MOA with EPA and guidance documents

What the inventory/Grouping looks like

Table 1. Room Grouping Summary

Group # / Construction Year	Location	# Rooms	# Proposed Samples
1/1949	Most administration rooms, classrooms, and hallway associated with original construction – Rooms A1, A2, A3, A4, A5, A6, and H3	7	3
2/1954	Administration rooms and classrooms in 1954 addition – Rooms A7, A8, A9, A10, A11, A12, and A13	7	3
3/1949	Classrooms, hallway, and storage in original construction – Rooms B1, B2, B3, B4, B5, B6, B7, B8, B9, and B10, H2, and ST1	12	4

What the Inventory/Grouping looks like

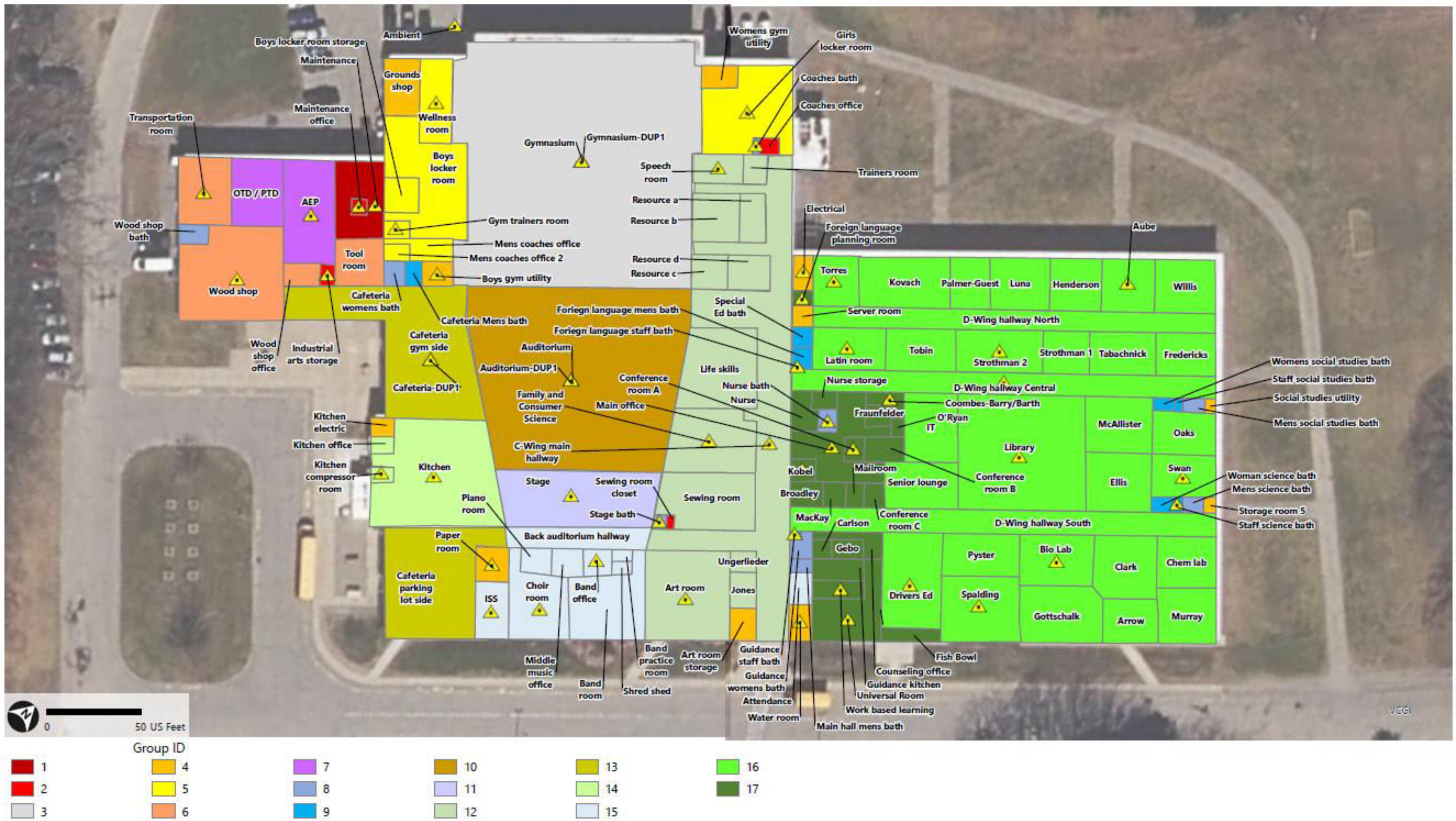
Group #	Room ID	Sample ID	Justification	Potential PCB Containing Materials
1	A1	5212-A1 / 5212-A1-FD	Representative administrative room. Includes transformer.	Carpet mastic, paint, ceiling tiles, transformer
	A6	5212-A6	Representative administrative room. Spatial distribution.	Carpet mastic, paint, cove base, ceiling tiles
	H3	5212-H3	Representative hallway	Cove base, paint, carpet mastic, ceiling tile

BFUHS Grouping

Figure 2: First Floor Plan, Grouping, and Proposed Sample Locations

Bellows Falls High School | Bellows Falls, VT

April 19, 2023



Source: Orthoimagery by VCGI (2018), Rooms digitized by VHB (2023).

What does IA Sampling Look Like

- Number of samples:
  - Groups with multiple spaces shall sample, at a minimum, 30% of spaces in each group.
- Analytical/Sampling:
  - 24 hour sampling event
  - TO-10A (5L/min)
  - EPA method 8082
  - RL of 10ng/m3 or below

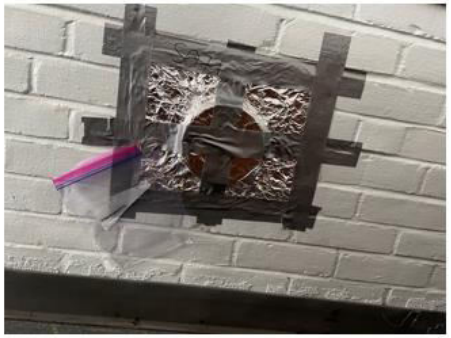
Picture of Indoor Air Sampler for PCBs

University of Iowa Superfund Research Program

Rank	Surface
1	Glass blocks
2	Brick wall
3	Cinderblock wall
4	Floor tile
5	Dry wall
6	Cove base
7	Carpet

1: Glass blocks

2: Brick wall



3: Cinderblock wall

Funding – Sampling Indoor Air

- Average Inventory ($,700-$16,000)
- Average Indoor Air Sampling ($11,000 - $30,000)
- Estimated Building Material Sampling ($10,000-$300,000)
- Estimated Cleanup ($50,000 -$18M)

Funding – Assessment and Mitigation

- Mitigation measures are immediate/interim steps to reduce or offset known negative effects. Common measures for mitigating PCB levels in indoor air include:
  - Increasing ventilation
  - Providing or increasing air filtration
- Mitigation is coupled with investigation and building materials testing to identify PCB sources
  - Important because often source(s) of the PCBs are not immediately evident
  - Access to funding is essential to responding quickly to exceedances of established action levels

Funding – Remediation

- Remediation measures are intended to permanently address identified sources of PCB contamination. Common measures for remediating PCB levels in indoor air include:
  - Upgrading air handling/ventilation systems
  - Isolating/encapsulating suspected or known PCB source(s)
  - Removing and properly disposing of PCB-containing building materials
- Current funding: $13M for schools (assessment/mitigation/cleanup)
- *$16M for BHS*

Funding – Remediation

- All activities that are approved by DEC as a part of the Corrective Action Plan are eligible for funding.
- AOE will administer grants through its existing grant management process. DEC will oversee work and payment will be made on a reimbursement basis after DEC approval of work.

What we are learning

Number of schools requiring testing	Number of schools where inventories have been approved by SMS to conduct	Number of schools where Indoor Air testing has been approved by SMS to implement (% complete)	Number of schools with at least one sample that exceeded the SAL (% exceeded)	Number of schools with at least one sample that exceeded the IAL (% exceeded)	Number of schools with all results below the SAL
324	160 (49%)	116 (36%)	31 (34%)	13 (14%)	59 (66%)

What we are learning

Highest IA results are between 600 ng/m3 at Green Mountain – 880 ng/m3 at Bellows Falls Union High School

Twin Valley Elementary

- Spray on Fireproofing 33,000 mg/kg
- Cove Mastic 2,300 mg/kg
- Duct Mastic 4,700 mg/kg
- Floor Coating 1,930 mg/kg
- Expansion Joint 740 mg/kg

Poultney Elementary

- Window caulk 240,000 mg/kg
- Doorframe caulk 13,700 mg/kg
- Expansion Joint caulk 107,000 mg/kg

Green Mountain High School

- Window Caulk 460,000 mg/kg
- Stair Trim caulk 120,000 mg/kg

What we are learning

- Best laid plans…..
  - Simple is better when it comes to communication
  - Always budget for more time
  - Always budget for more money
  - Communicate, Communicate, Communicate….with EVERYONE
- Build strong teams and a good support system!
- You might find something in a school that is NOT PCBs
- Build a program that can grow and change.
- Lots to explain around differences in values –Vermont (SV, SAL, IAL) and EPA (Exposure Levels)
- We have a lot more to do!

Resources

- Common Misconceptions about PCBs Obscure the Crisis of Children's Exposure in School: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9730834/
- VT School Action Levels: https://www.healthvermont.gov/sites/default/files/documents/pdf/ENV-PCB-school-action-level-development.pdf
- VT PCB Screening Value: https://www.healthvermont.gov/sites/default/files/documents/pdf/ENV-PCB-indoor-air-screening-value-development.pdf
- The Class of 1964 Policy Research Shop, PCB testing in Vermont Public Schools: https://legislature.vermont.gov/Documents/2024/WorkGroups/House%20Education/PCB%20Testing/W~Gretchen%20Bauman~PBC%20Testing%20in%20Vermont%20Public%20Schools%20-%20Dartmouth%20College%20Policy%20Research%20Shop~2-28-2023.pdf

Resources

- VTDEC Website:

https://dec.vermont.gov/waste-management/contaminated-sites/PCBsinSchools

- HEALTH Website

https://www.healthvermont.gov/environment/chemicals/polychlorinated-biphenyls-pcbs

Contact Info

VTDEC

SOV.PCBSampling@vermont.gov

Health

ahs.vdhpcbschoolsampling@vermont.gov

School Action Levels and Temporary Occupancy Options for PCBs in Indoor Air of Schools

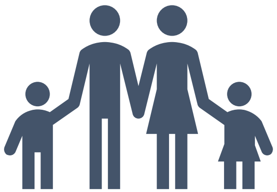
Sarah Owen, PhD

State Toxicologist

PCB Symposium
November 1, 2023

VERMONT
DEPARTMENT OF HEALTH

PCBs can affect our health in many ways



Cancer

- Breast
- Liver
- Melanoma

Noncancer

- Immune
- Reproductive
- Nervous
- Endocrine

PCBs increase our risk of getting cancer

PCBs cause malignant melanoma, and are associated with non-Hodgkin lymphoma, breast and liver cancer.

- Environmental Protection Agency:
  probable human carcinogens
- International Agency for Research on Carcinogens:
  carcinogenic to humans
- National Toxicology Program:
  reasonably anticipated to be human carcinogens
- National Institute for Occupational Safety and Health:
  potential occupational carcinogens

PCBs have negative effects on the immune system

- Studies have revealed serious effects on the immune system after exposure to PCBs:
  - Significant decrease in the size of the thymus gland, which is critical to immune systems of infants
  - Reductions in the response of the immune system
  - Decreased resistance to Epstein-Barr virus and other infections
- PCBs suppress the immune system, which is thought to be a reason why PCBs also cause cancer.

PCBs have long-lasting effects on the reproductive system

- Studies have shown potentially serious effects on the reproductive system:
  - Reduced birth weight
  - Reduced conception rate
  - Reduced live birth rates
  - Reduced sperm counts
- High exposure to PCBs in certain populations showed:
  - Decreased birth weight
  - Significant decrease in gestational age

PCBs have negative effects on nervous system development

- Proper development of the nervous system is critical for early learning and can impact the health of individuals throughout their lives.
- Studies have shown PCBs affect nervous system development:
  - Significant and persistent deficits in neurological development, including visual recognition, short-term memory and learning
  - Learning deficits and changes in activity after exposure to PCBs

PCBs can impact the level of thyroid hormone

- Thyroid hormone levels are critical for normal growth and development.
- Studies have shown that PCBs:
  - Decrease thyroid hormone levels, which results in developmental deficits, including decreased hearing
  - Are associated with changes in thyroid hormone levels in infants

At BHS, indoor air levels of PCBs were as high as 6,300 ng/m^3

Release of Airborne Polychlorinated Biphenyls from New Bedford Harbor Results in Elevated Concentrations in the Surrounding Air

Andres Martinez,[*,†] Bailey N. Hadnott,[†] Andrew M. Awad,[†] Nicholas J. Herkert,[†] Kathryn Tomsho,[‡] Komal Basra,[‡] Madeleine K. Scammell,[‡] Wendy Heiger-Bernays,[‡] and Keri C. Hornbuckle[*,†]

[†]Department of Civil & Environmental Engineering, IIHR-Hydroscience and Engineering, 4105 Seamans Center for the Engineering Arts and Sciences, The University of Iowa, Iowa City, Iowa 52242, United States

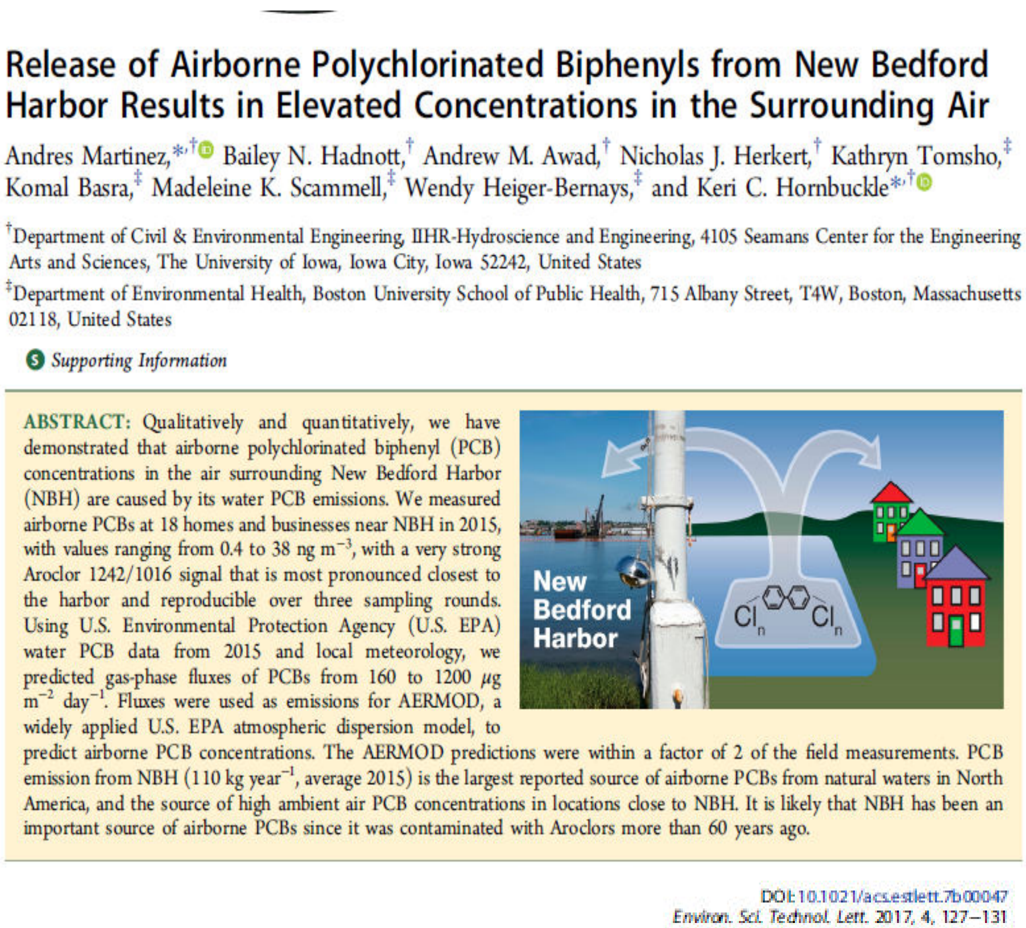
[‡]Department of Environmental Health, Boston University School of Public Health, 715 Albany Street, T4W, Boston, Massachusetts 02118, United States

Supporting Information

ABSTRACT: Qualitatively and quantitatively, we have demonstrated that airborne polychlorinated biphenyl (PCB) concentrations in the air surrounding New Bedford Harbor (NBH) are caused by its water PCB emissions. We measured airborne PCBs at 18 homes and businesses near NBH in 2015, with values ranging from 0.4 to 38 ng m^{-3}, with a very strong Aroclor 1242/1016 signal that is most pronounced closest to the harbor and reproducible over three sampling rounds. Using U.S. Environmental Protection Agency (U.S. EPA) water PCB data from 2015 and local meteorology, we predicted gas-phase fluxes of PCBs from 160 to 1200 μg m^{-2} day^{-1}. Fluxes were used as emissions for AERMOD, a widely applied U.S. EPA atmospheric dispersion model, to predict airborne PCB concentrations. The AERMOD predictions were within a factor of 2 of the field measurements. PCB emission from NBH (110 kg year^{-1}, average 2015) is the largest reported source of airborne PCBs from natural waters in North America, and the source of high ambient air PCB concentrations in locations close to NBH. It is likely that NBH has been an important source of airborne PCBs since it was contaminated with Aroclors more than 60 years ago.

DOI: 10.1021/acs.estlett.7b00047
Environ. Sci. Technol. Lett. 2017, 4, 127−131

At BHS, indoor air levels of PCBs were as high as 6,300 ng/m^3



Release of Airborne Polychlorinated Biphenyls from New Bedford Harbor Results in Elevated Concentrations in the Surrounding Air

Andres Martinez,*[†] Bailey N. Hadnott,[†] Andrew M. Awad,[†] Nicholas J. Herkert,[†] Kathryn Tomsho,[‡] Komal Basra,[‡] Madeleine K. Scammell,[‡] Wendy Heiger-Bernays,[‡] and Keri C. Hornbuckle*[†]

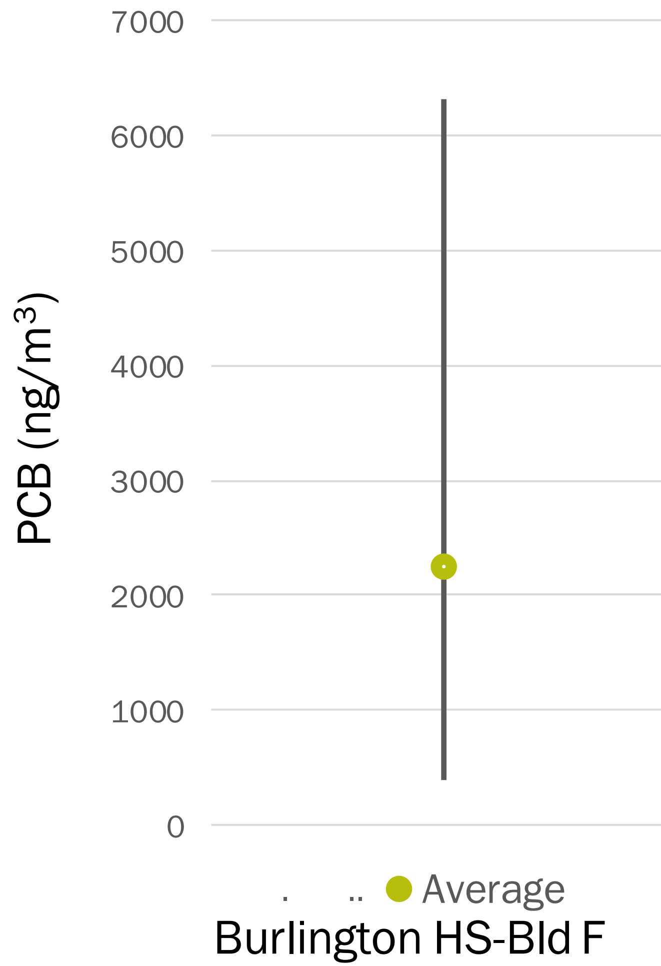
[†]Department of Civil & Environmental Engineering, IIHR-Hydroscience and Engineering, 4105 Seamans Center for the Engineering Arts and Sciences, The University of Iowa, Iowa City, Iowa 52242, United States

[‡]Department of Environmental Health, Boston University School of Public Health, 715 Albany Street, T4W, Boston, Massachusetts 02118, United States

Supporting Information

ABSTRACT: Qualitatively and quantitatively, we have demonstrated that airborne polychlorinated biphenyl (PCB) concentrations in the air surrounding New Bedford Harbor (NBH) are caused by its water PCB emissions. We measured airborne PCBs at 18 homes and businesses near NBH in 2015, with values ranging from 0.4 to 38 ng m^{-3}, with a very strong Aroclor 1242/1016 signal that is most pronounced closest to the harbor and reproducible over three sampling rounds. Using U.S. Environmental Protection Agency (U.S. EPA) water PCB data from 2015 and local meteorology, we predicted gas-phase fluxes of PCBs from 160 to 1200 μg m^{-2} day^{-1}. Fluxes were used as emissions for AERMOD, a widely applied U.S. EPA atmospheric dispersion model, to predict airborne PCB concentrations. The AERMOD predictions were within a factor of 2 of the field measurements. PCB emission from NBH (110 kg year^{-1}, average 2015) is the largest reported source of airborne PCBs from natural waters in North America, and the source of high ambient air PCB concentrations in locations close to NBH. It is likely that NBH has been an important source of airborne PCBs since it was contaminated with Aroclors more than 60 years ago.

DOI: 10.1021/acs.estlett.7b00047
Environ. Sci. Technol. Lett. 2017, 4, 127−131



PCBs in school air is a significant contributor to PCB exposure

High levels of PCBs in school indoor air represent the biggest of exposure for students and staff.

DOI: 10.1021/acs.est.7b01910
Environ. Sci. Technol. 2017, 51, 7853−7860

Vermont levels for PCBs in indoor air are based on EPAs framework and levels

	Vermont	US EPA
	Air level (ng/m³)	
Screening level: *health based*	15	5
School Action levels: *risk management*	30 – 100 (regulatory)	100 – 600 (not regulatory)
Immediate action levels: *needs immediate attention*	90 – 300	490

Polychlorinated Biphenyls (PCBs) in Schools | Vermont Department of Health (healthvermont.gov)

School Action Levels are risk management levels and are based on noncancer health effects.

	Pre-Kindergarten	Kindergarten to Grade 6	Grade 7 to Adult
School Action Level	30	60	100

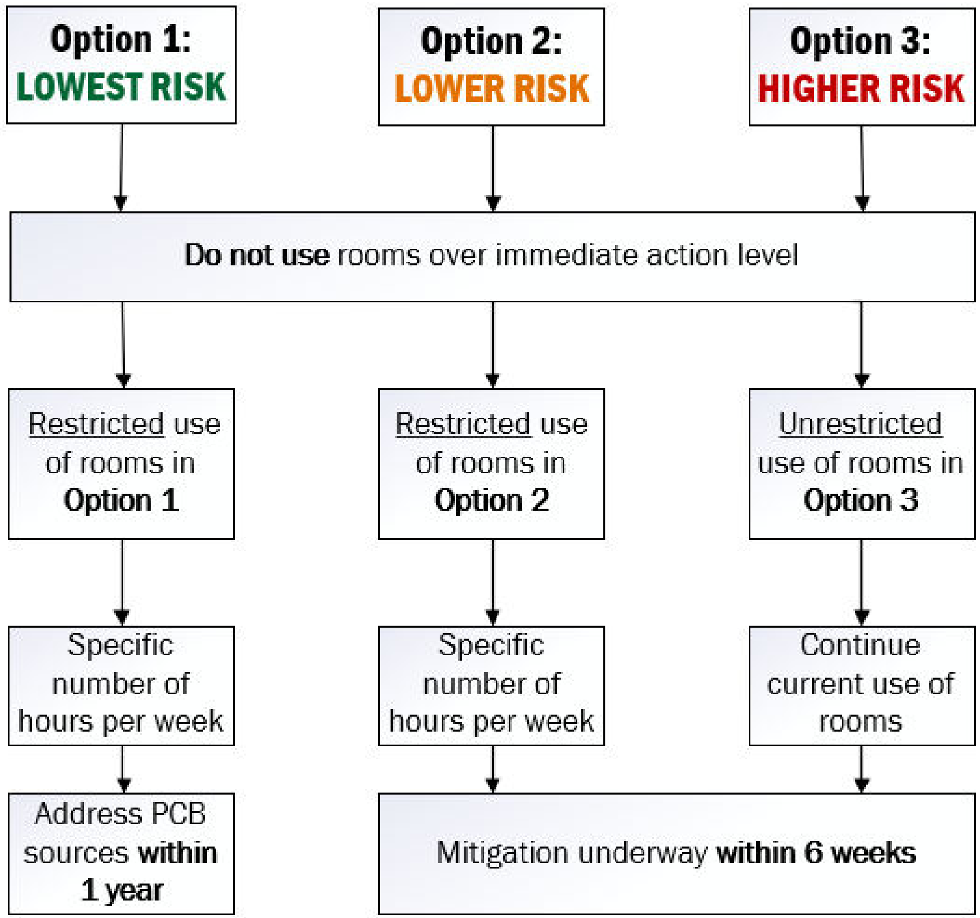
Action levels are risk management levels, and do not replace the screening level (SL).

SALs are calculated using the same exposure assumptions as SL: 235 days a year, 9.75 hours per day.

Calculated based on HI. Highest cancer risk (30 years) 6 in a million

PCBs in Indoor Air of Schools, Development of School Action Levels (healthvermont.gov)

Occupancy options depend on the results within the group and the level of risk the community is willing to accept



[PCBs in Indoor Air of Schools, Short-Term Occupancy Options (healthvermont.gov)]

Schools will have several options if PCBs are at or above the school action level

- Each school will receive an individualized letter detailing results and next steps.
- Schools can choose from several occupancy options to reduce exposures to students and staff while working with DEC to address the sources of PCBs.
- Schools must stop using rooms three times higher than the immediate action level (IAL) and untested rooms in the same group
- We will work with schools to find options that work for them, and support schools to communicate the results and health risks to staff and families.

Room	Group	Result (ng/m^3)	Option 1 30 hours PreK	Option 1 37 hours K-6	Option 1 No limit 7-Adult	Option 2 30 hours PreK	Option 2 37 hours K-6	Option 2 No limit 7-Adult	Option 3 No limit PreK	Option 3 No limit K-6	Option 3 No limit 7-Adult
Room 200	10	Not Tested	Use	Use	Use	Use	Use	Use	Use	Use	Use
Room 201	10	Not detected	Use	Use	Use	Use	Use	Use	Use	Use	Use
Room 203	10	120	Not use	Not use	Not use	Use	Use	Use	Use	Use	Use
Room 206A	10	Not Tested	Use	Use	Use	Use	Use	Use	Use	Use	Use
Room 205	10	Not Tested	Use	Use	Use	Use	Use	Use	Use	Use	Use
Room 102	11	Not Tested	Use	Use	Use	Use	Use	Use	Use	Use	Use
Room 103	11	Not detected	Use	Use	Use	Use	Use	Use	Use	Use	Use
Gym	12	Not detected	Use	Use	Use	Use	Use	Use	Use	Use	Use
Stage	12	Not Tested	Use	Use	Use	Use	Use	Use	Use	Use	Use
Room 103A	13	Not Tested	Not Use	Not Use	Not Use	Use	Use	Use	Use	Use	Use
Room 103B	13	Not Tested	Not Use	Not Use	Not Use	Use	Use	Use	Use	Use	Use
Room 112	13	110	Not use	Not use	Not use	Use	Use	Use	Use	Use	Use
Room 112A	14	Not detected	Use	Use	Use	Use	Use	Use	Use	Use	Use

VERMONT
DEPARTMENT OF HEALTH

Questions?

sarah.c.owen@vermont.gov