



Evaluating Stormwater Recontamination Impacts on Portland Harbor Remedies



Presented by

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Stormwater Issues at Aquatic Superfund Sites

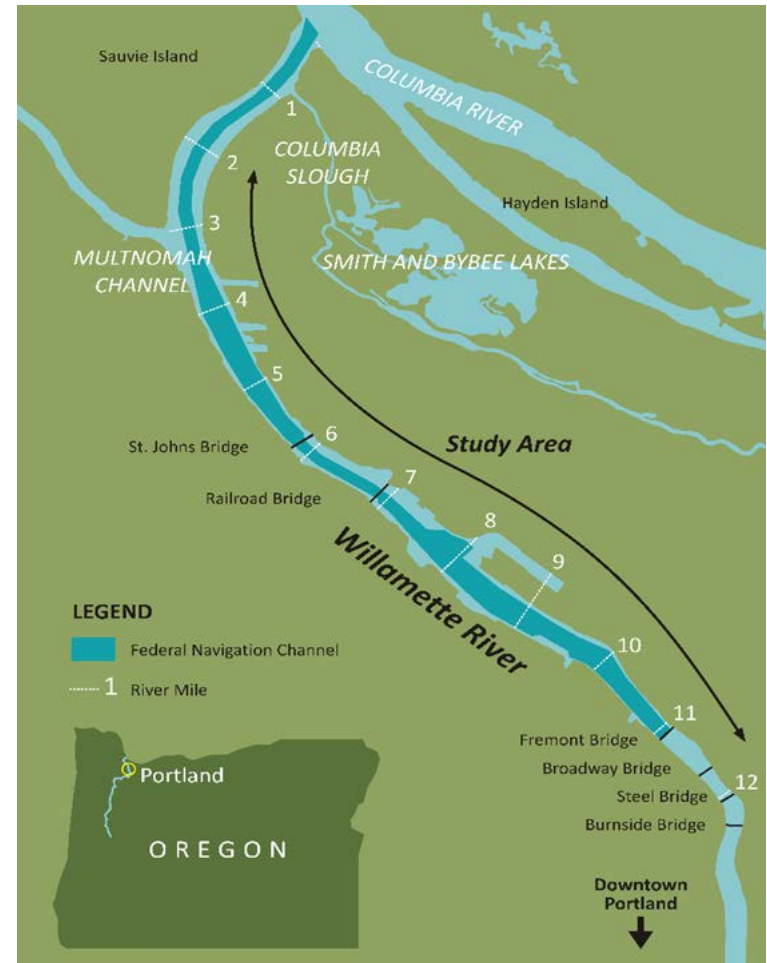
- Potential contamination/recontamination source
- Diffuse and hard-to-control sources
- Relative magnitude frequently unknown
- Existing data often fragmented or limited

Presentation Outline

- Overview of Portland Harbor
- Objectives of Stormwater Loading Analysis
- Sampling Methods
- Loading Calculations
- Input into Chemical Fate and PCB Bioaccumulation Model
- Conclusions

Portland Harbor Superfund Site

- 10 river miles \approx 2,200 acres
- Many contaminants of potential concern
 - PCBs
 - PAHs
 - Dioxin/furan
 - Others
 - DDx
- Draft FS submitted to USEPA, Region 10
 - March 2012
 - More than 10 years of site investigation and evaluation
 - Assist USEPA in selecting a comprehensive contaminated sediment remedy



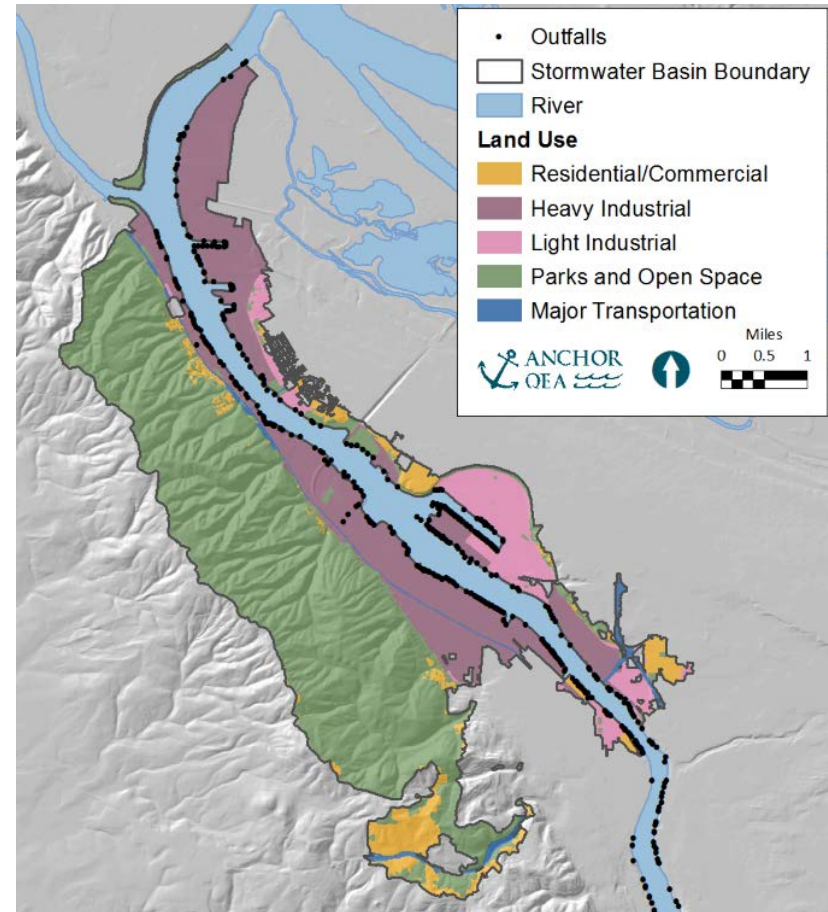
Investigation Objectives

- Assess contribution of stormwater to
 - Water column
 - Sediments
 - Fish tissue
- Where is the risk coming from?
- Input to cleanup decision and timing of cleanup



Portland Harbor Stormwater Loading

- More than 400 outfalls
- Representative outfalls sampled (15 outfalls)
 - Estimated loadings based on outfall data associated with various land use types
- Certain sites/basins sampled as site-specific contributors for some chemicals (15 outfalls)



LWG Site Sampling Rationale

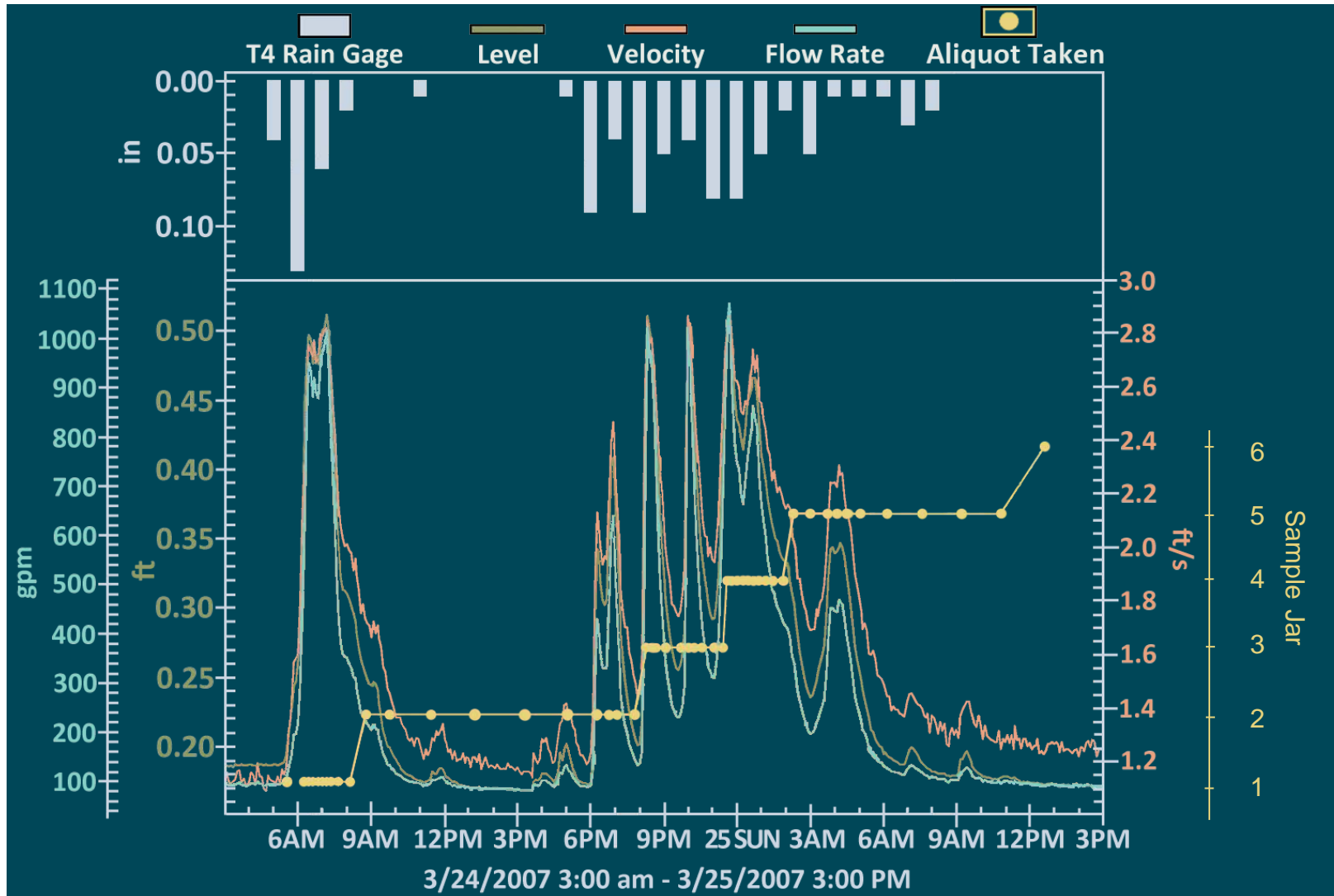
- Extensive effort with the City of Portland to characterize land use and drainage basins within the study area
- Outfalls were selected on the basis of
 - Characterizing loads from a particular land use (15)
 - Heavy industrial (5), light industrial (4), residential (2), major transportation (3), and open space (1)
 - Understanding site-specific contributions to stormwater loads (15)

Composite Stormwater Samples

- Objectives
 - Measure chemical loading for complete storms
 - Calculate mean concentration
- Provides “snapshots” of loads from various storms
- Isco 6712 automatic samplers
 - Remotely programmed via cell phone



Typical Sampling Event



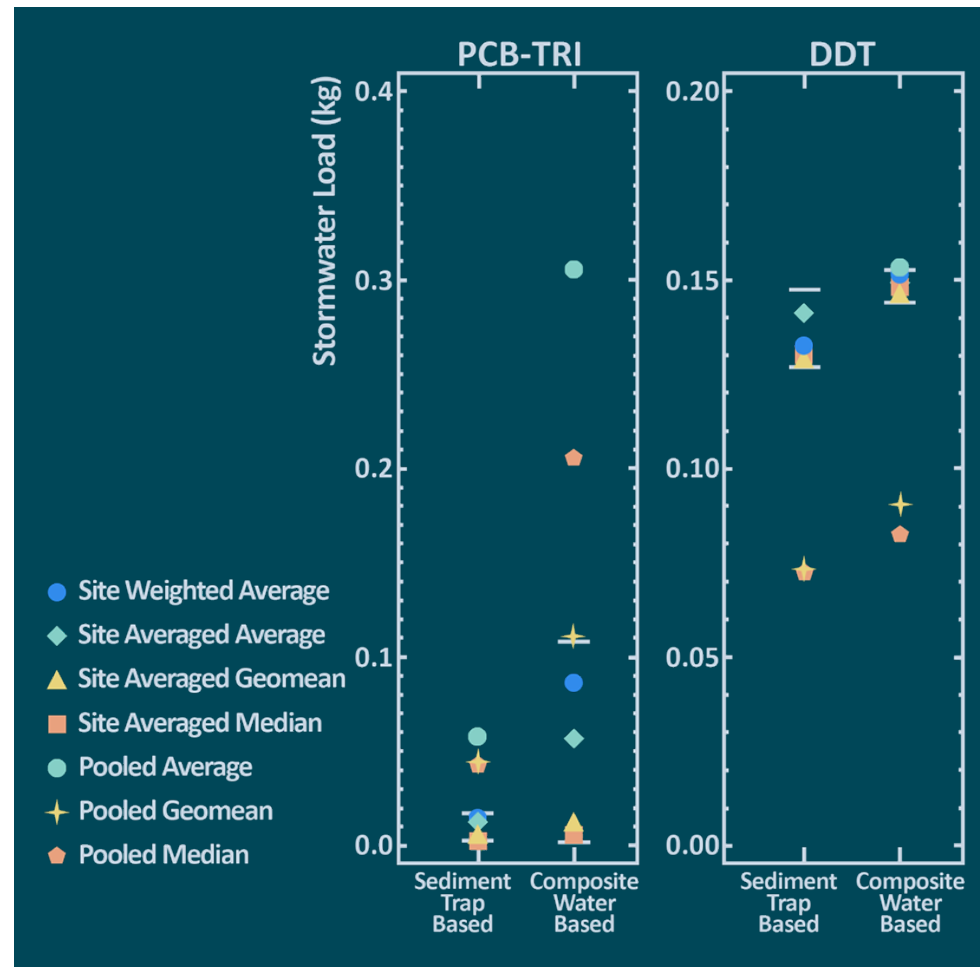
Sediment Traps

- Objective
 - Measure chemical particulate loads
- Left in place for 3 to 6 months
 - Integrates loading over entire wet season
- Measures particulate loads only
- Many organics highly associated with particulates

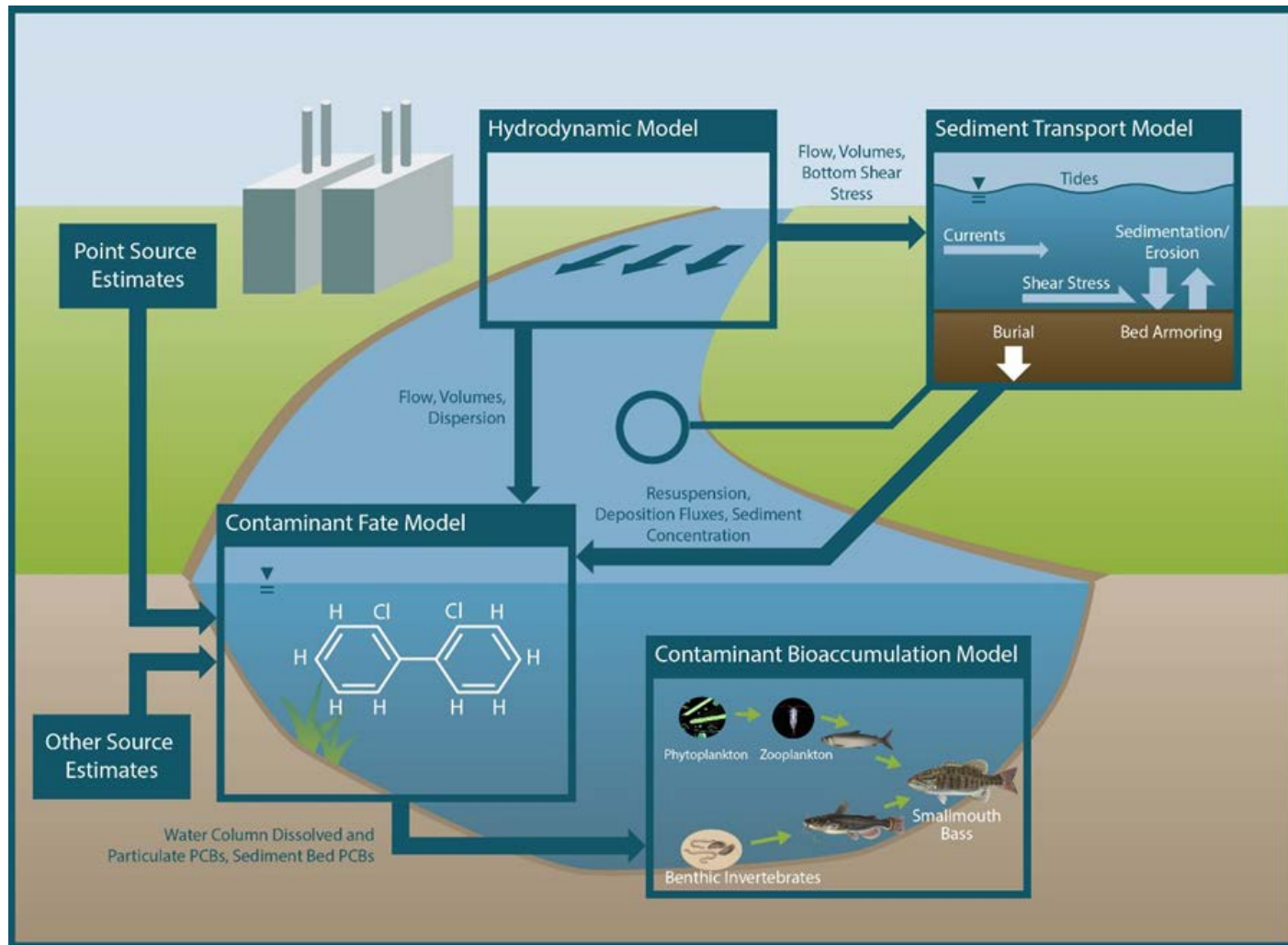


Comparison of Sediment Trap and Composite Water-based Loading Estimates

- Assess consistency of loads from sediment traps versus composite water
- Sediment trap-based loads were generally lower than composite water-based loads, but differences were less than an order of magnitude
- Helps confirm that sampling three storm events for composite water was representative of entire wet season



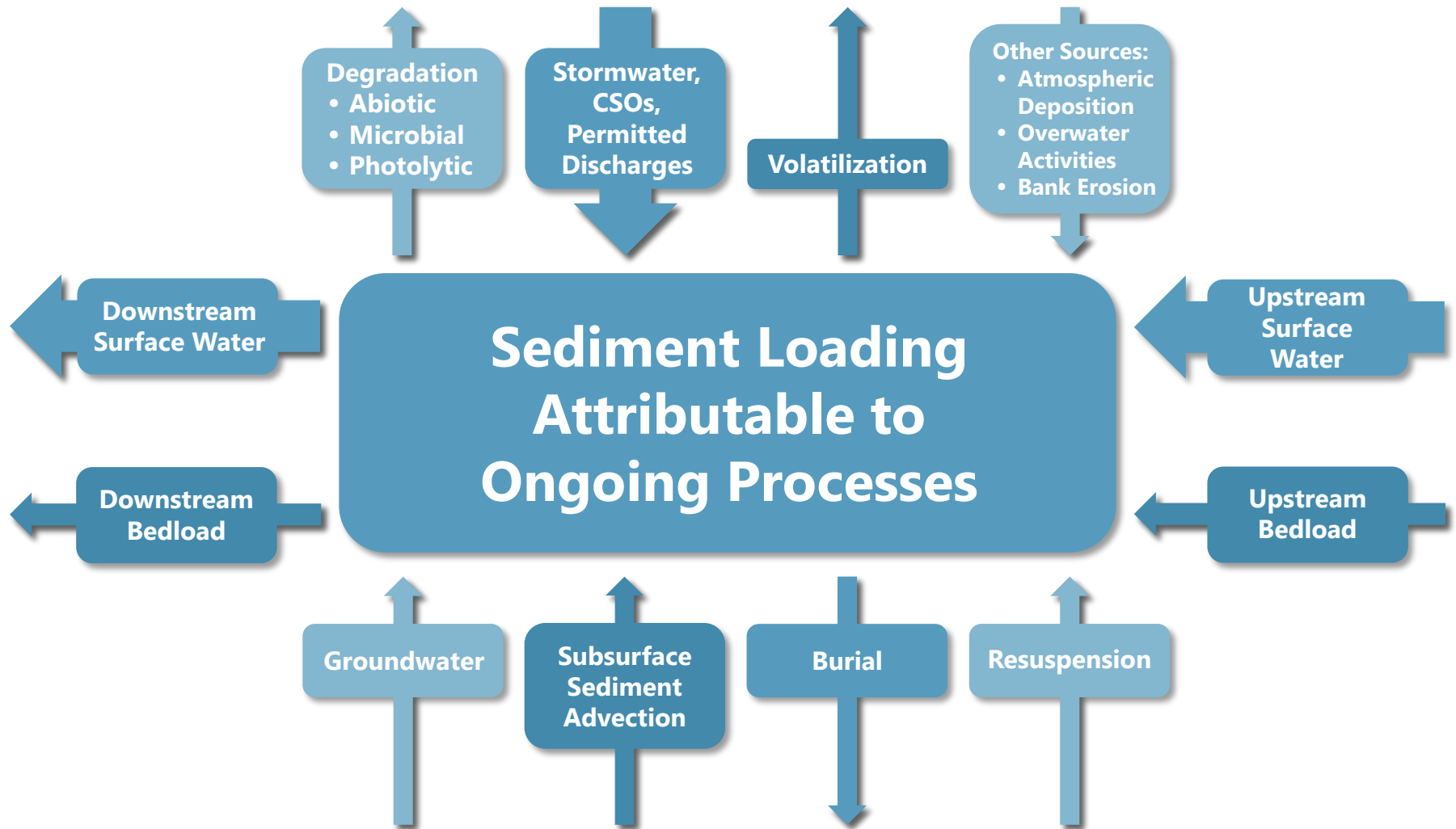
Stormwater Loading and Model Framework



General Model Setup

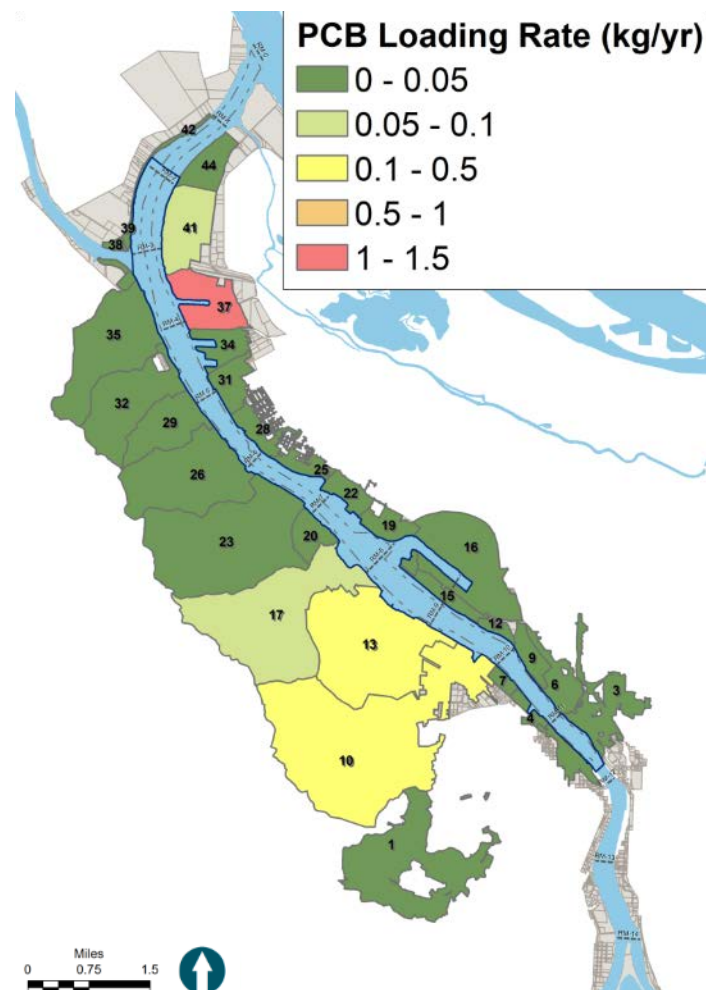
- Long-term 45-year simulation
- Utilized historical hydrograph (1979 to 2008)
 - Represents large range of flows
 - Includes large event with return period of >100 years
- External source loading conditions unchanged from calibration
- Outputs from Fate and Transport Model were input into PCB Bioaccumulation Model

Typical Sediment Loading



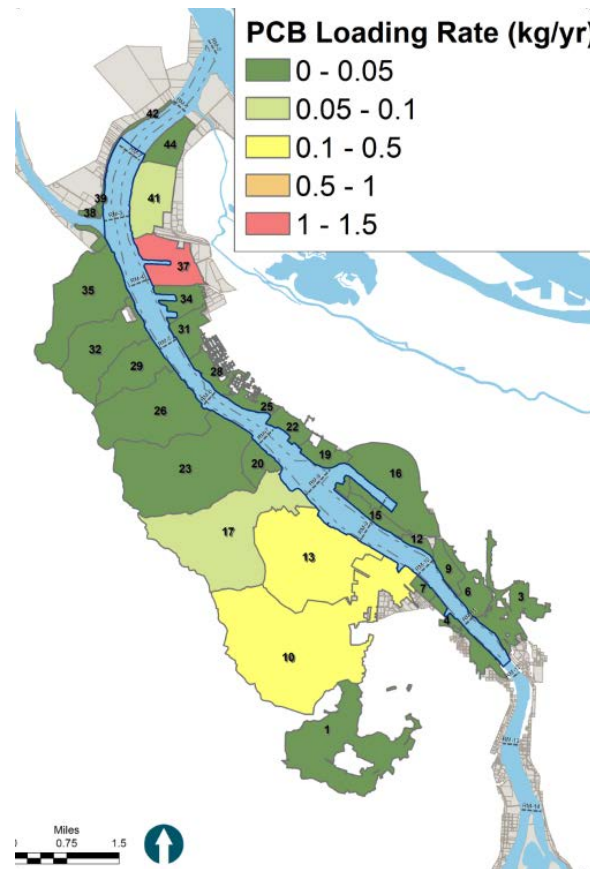
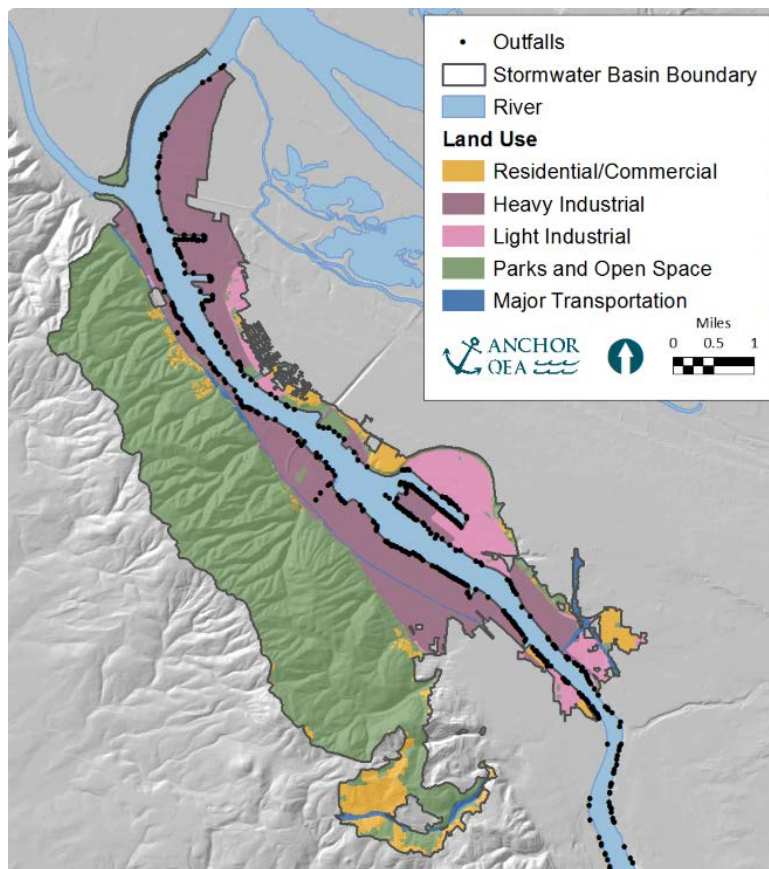
Stormwater PCB Loading Map

- Loadings calculated via
 - Land use
 - Site-specific sources
- Estimate loading for segments of shoreline
 - Not outfall-specific
- Relative loadings
 - High concentrations from small sites with less runoff volume have smaller load than low concentrations from large sites with large runoff volume



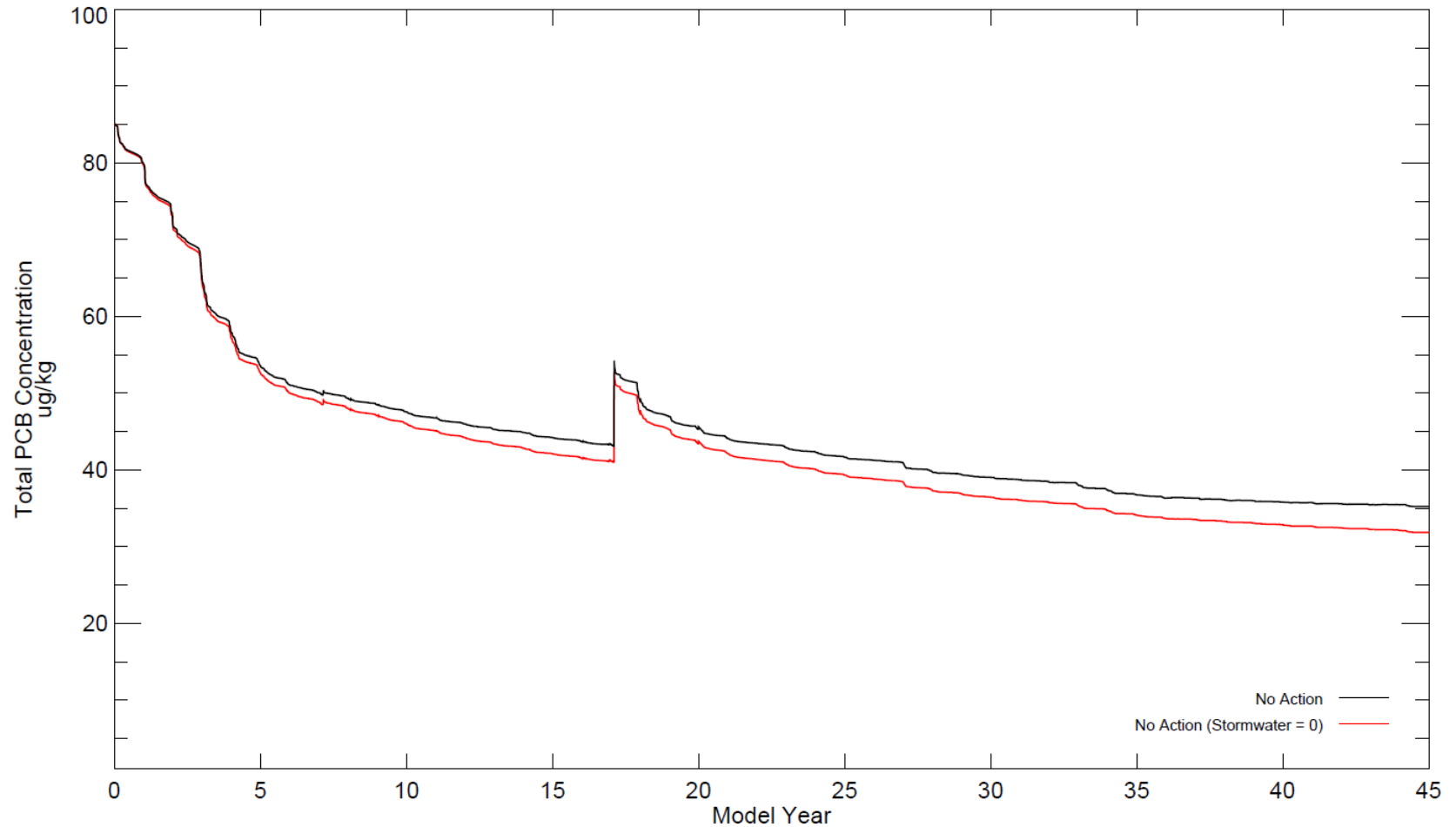
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Land Use Versus Stormwater PCB Load



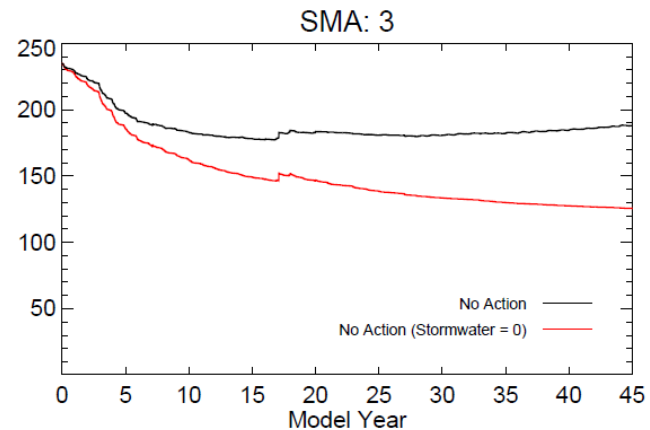
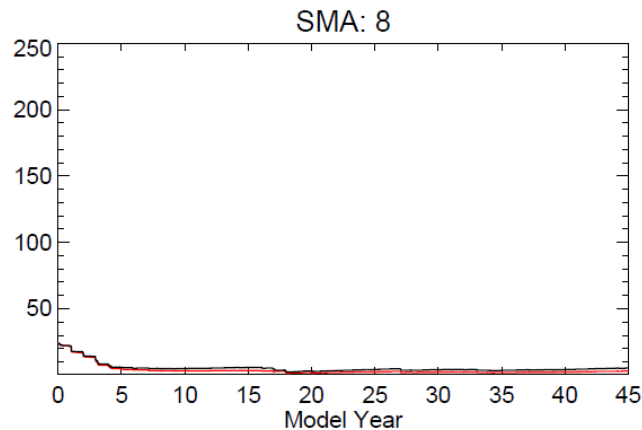
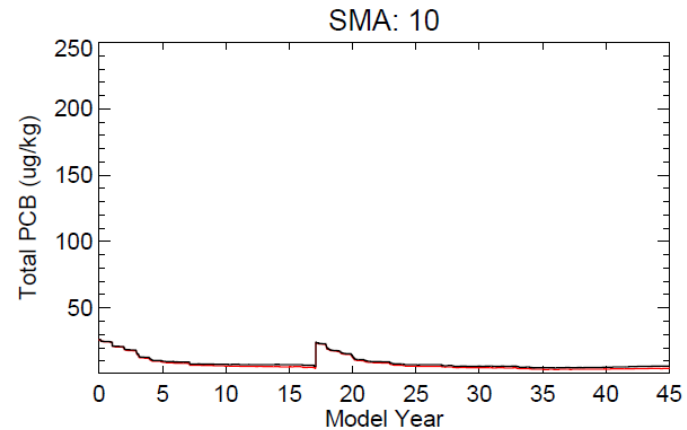
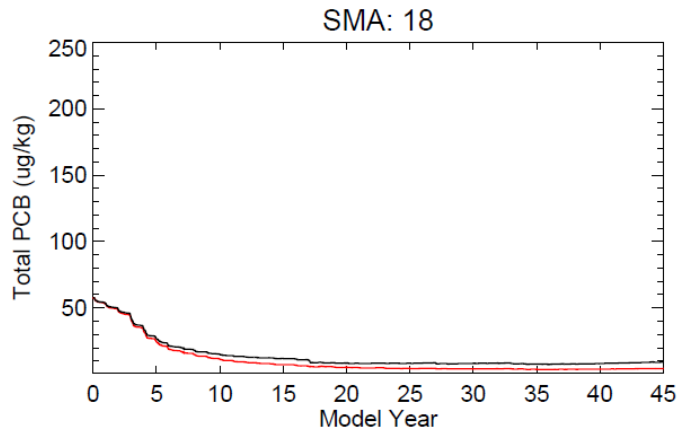
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Stormwater Impact on Sediment PCB Concentrations – Entire Study Area



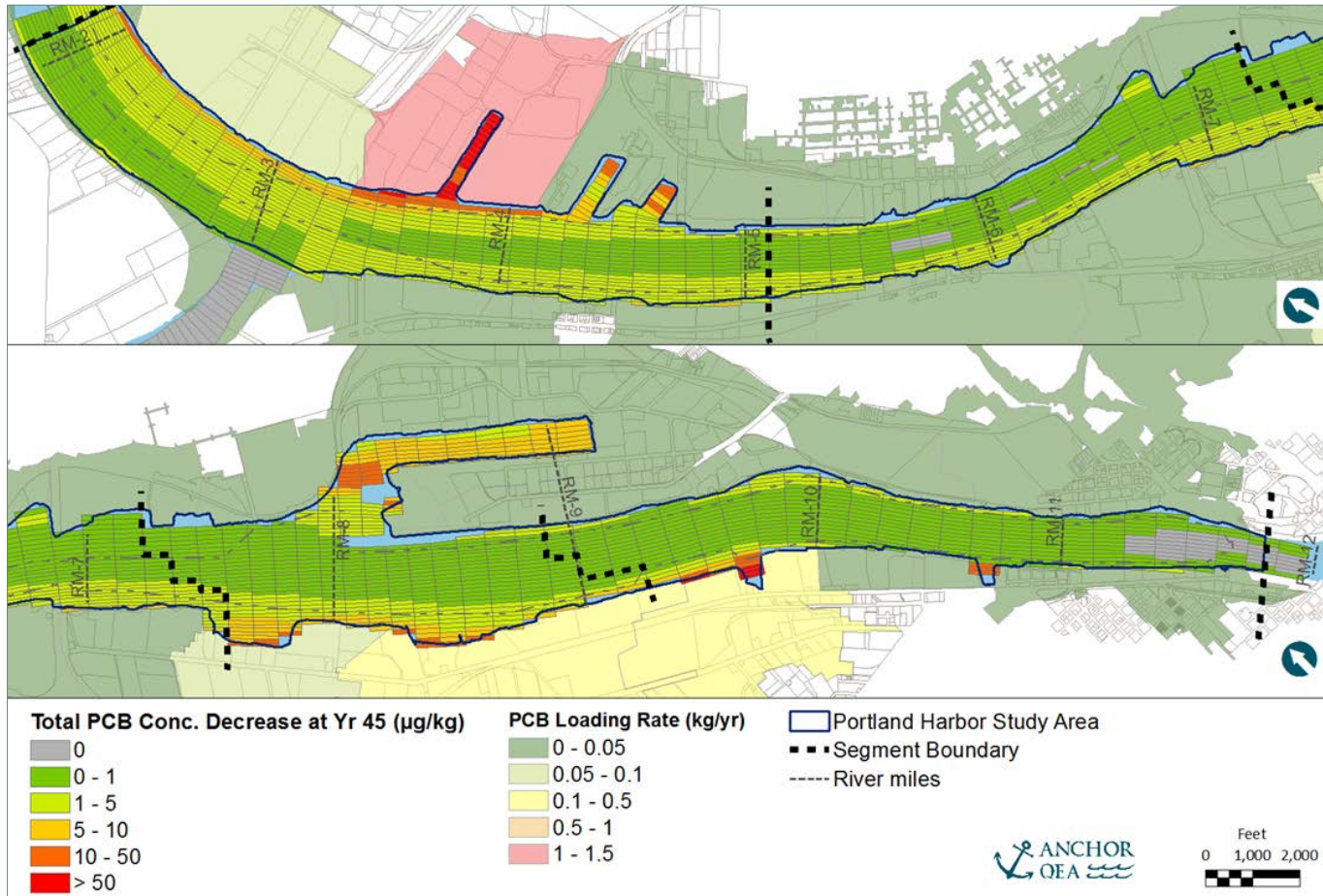
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Stormwater Impact on Sediment PCB Concentrations – Smaller Spatial Scale



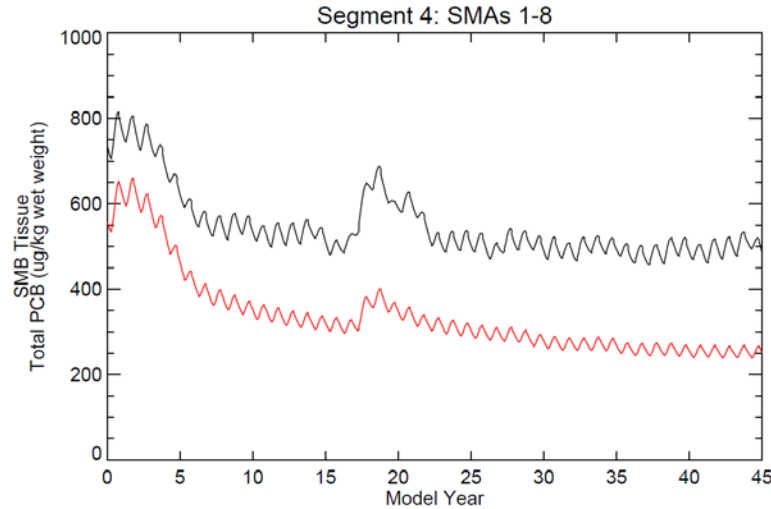
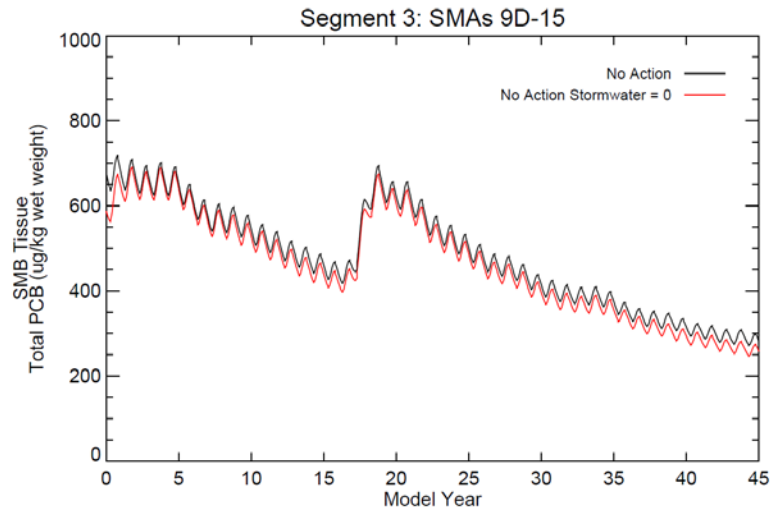
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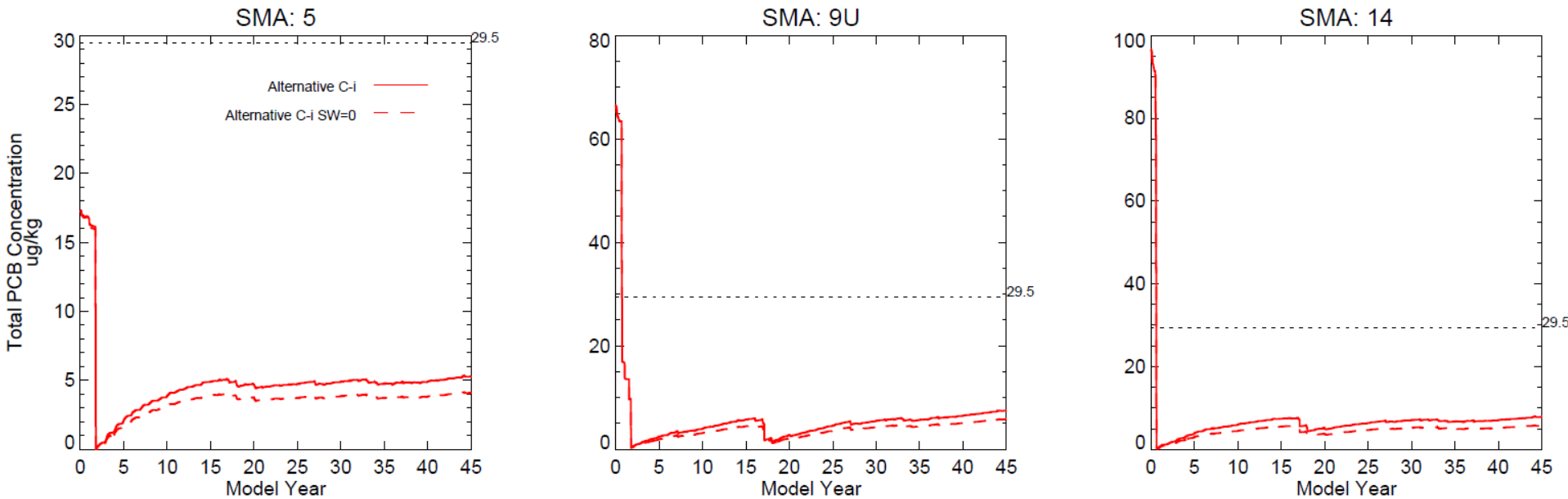
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Stormwater Impact on PCB Fish Tissue



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Future Source Controls Effect on Sediment Concentration



- Alternative C-i cap area Current Stormwater Loading Scenario
- - - Alternative C-i cap area Reduced Stormwater Loading Scenario

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Conclusions

- There is some uncertainty in the stormwater estimates based on
 - Numbers of outfalls and samples collected
 - Time period (2007/2008) of sampling
 - Variations in future precipitation and river flows
 - Additional source controls implemented since the sampling
- On a site-wide basis, stormwater currently represents a relatively small proportion of the overall chemical load to the system, particularly compared to upstream loads entering the site

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Conclusions

- Modeling of remediation scenarios at small scales indicated that 2007/2008 stormwater loads are expected to contribute to some increases in sediment concentrations after sediment remediation
 - These loads are unlikely to affect the achievement of long-term sediment remedial goals, except possibly at spatial scales smaller than those modeled (i.e., immediately in front of some outfalls)
- Continued implementation of stormwater source controls is expected to further minimize the potential for sediment recontamination, but some localized recontamination effects could occur

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Questions/Discussion

