

Insights Gained from the Development and Calibration of an Innovative Contaminant Fate and Transport Model

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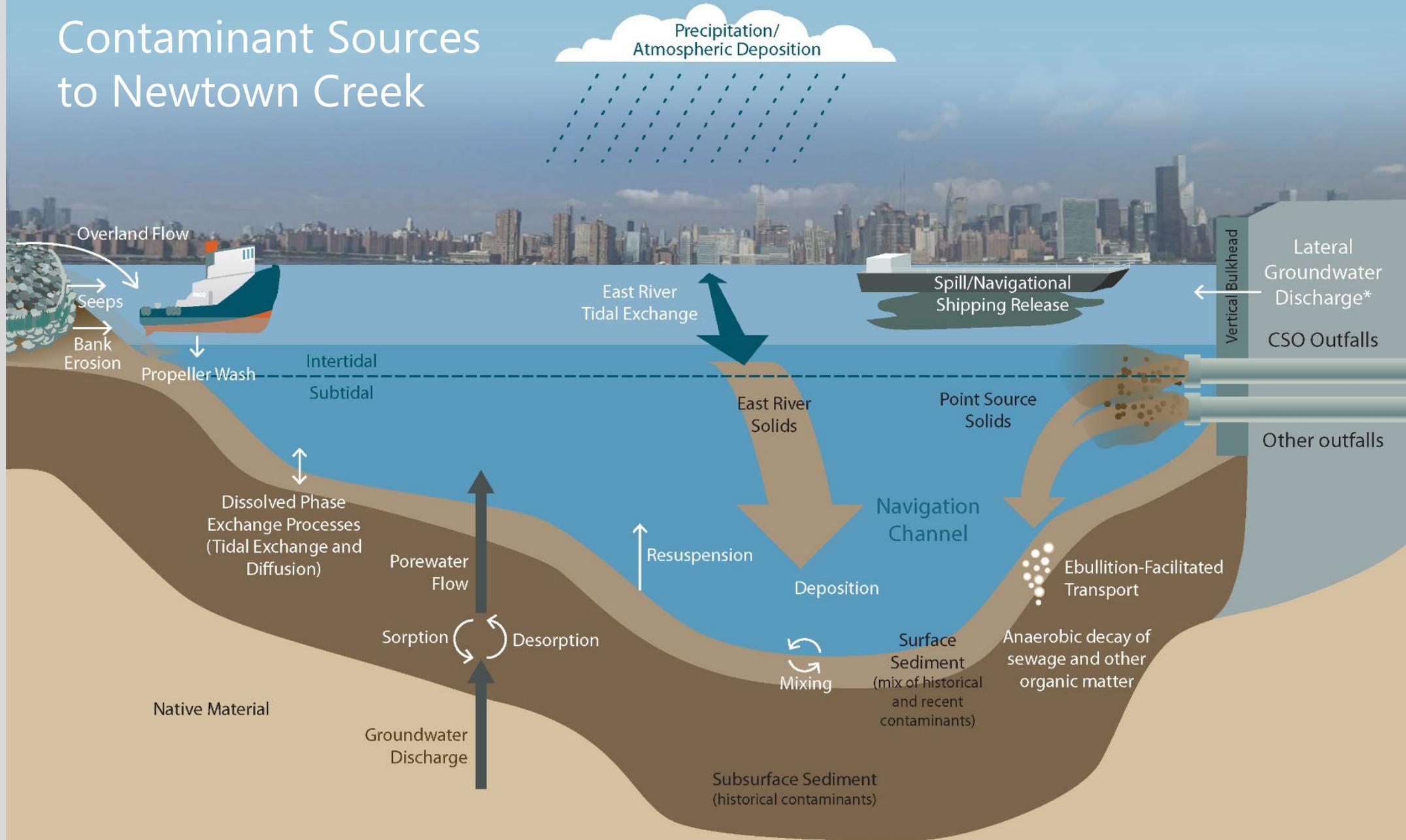


Photo by Bill Rhodes

Understand long-term influence of ongoing chemical loadings and legacy contamination on surface sediments and surface water

Evaluate effectiveness of potential remedial alternatives

Contaminant Sources to Newtown Creek

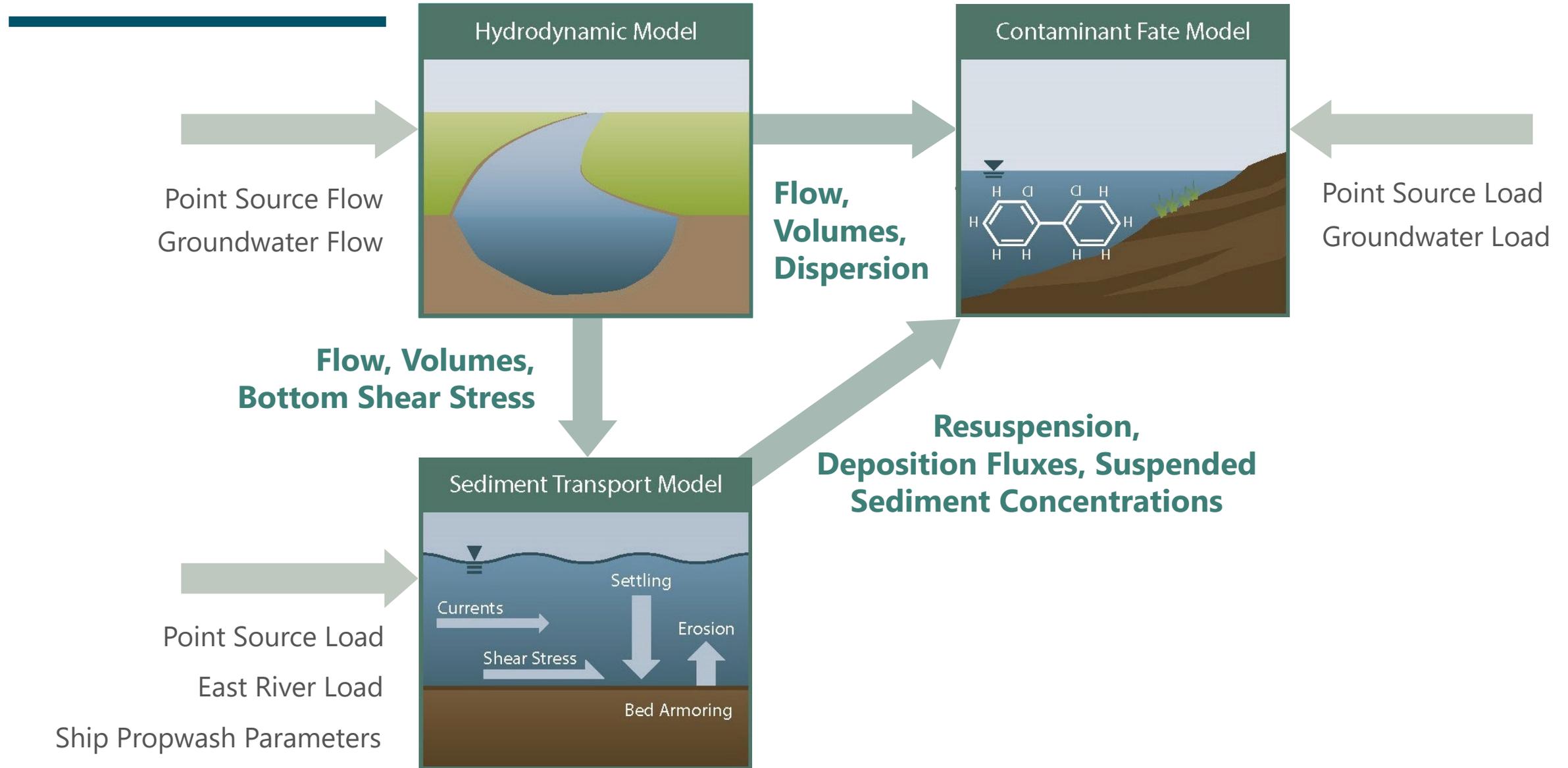


*Lateral groundwater discharges occur in vertical permeable shoreline areas that include vertical wood, precast concrete, and pile-support concrete bulkheads

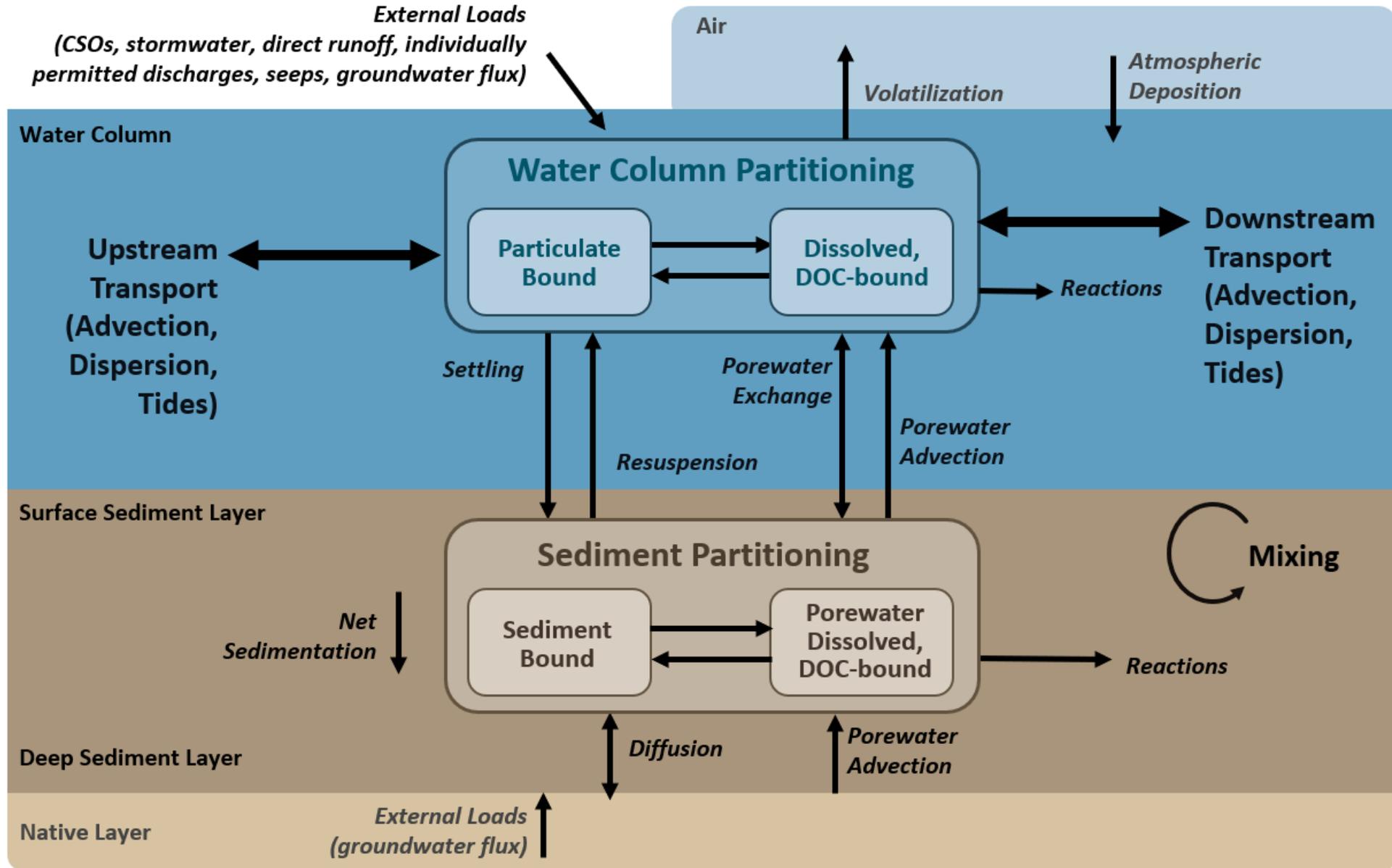
Newtown Creek Contaminant Fate and Transport Model

- Is one component of a rigorous modeling framework
- Includes multiple ongoing sources and in-creek processes
- Sediment remedy will evaluate multiple COCs that drive risk

MODELING FRAMEWORK

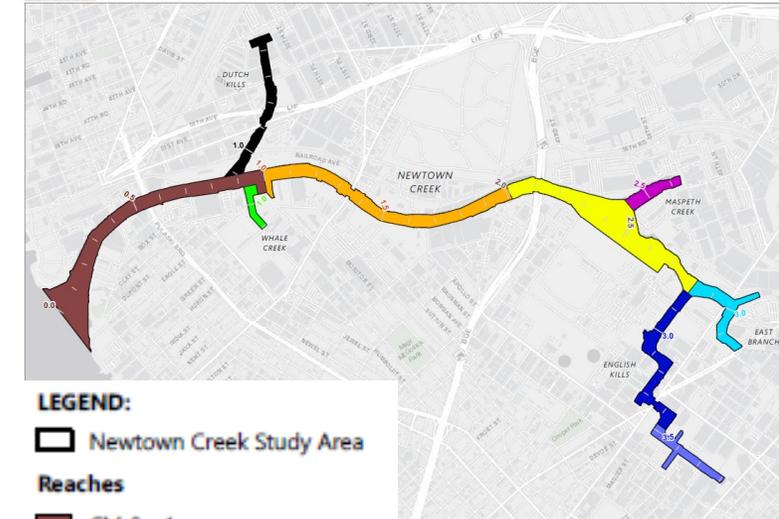
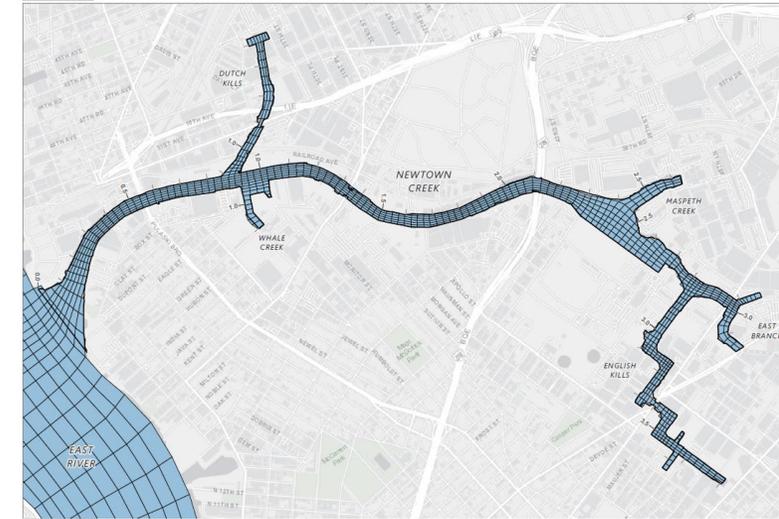


MODEL-SIMULATED PROCESSES



MODEL DEVELOPMENT

- Represents entire thickness of sediment
- Simulates COCs that contribute to risk and represent a wide range of mobility
 - 12 total: 5 PAH compounds, 6 PCB homologs, and copper
- Robust model calibration that captures key data features



LEGEND:

□ Newtown Creek Study Area

Reaches

■ CM 0 - 1

■ CM 1 - 2

■ CM 2+

■ Dutch Kills

■ Whale Creek

■ Maspeth Creek

■ Lower English Kills

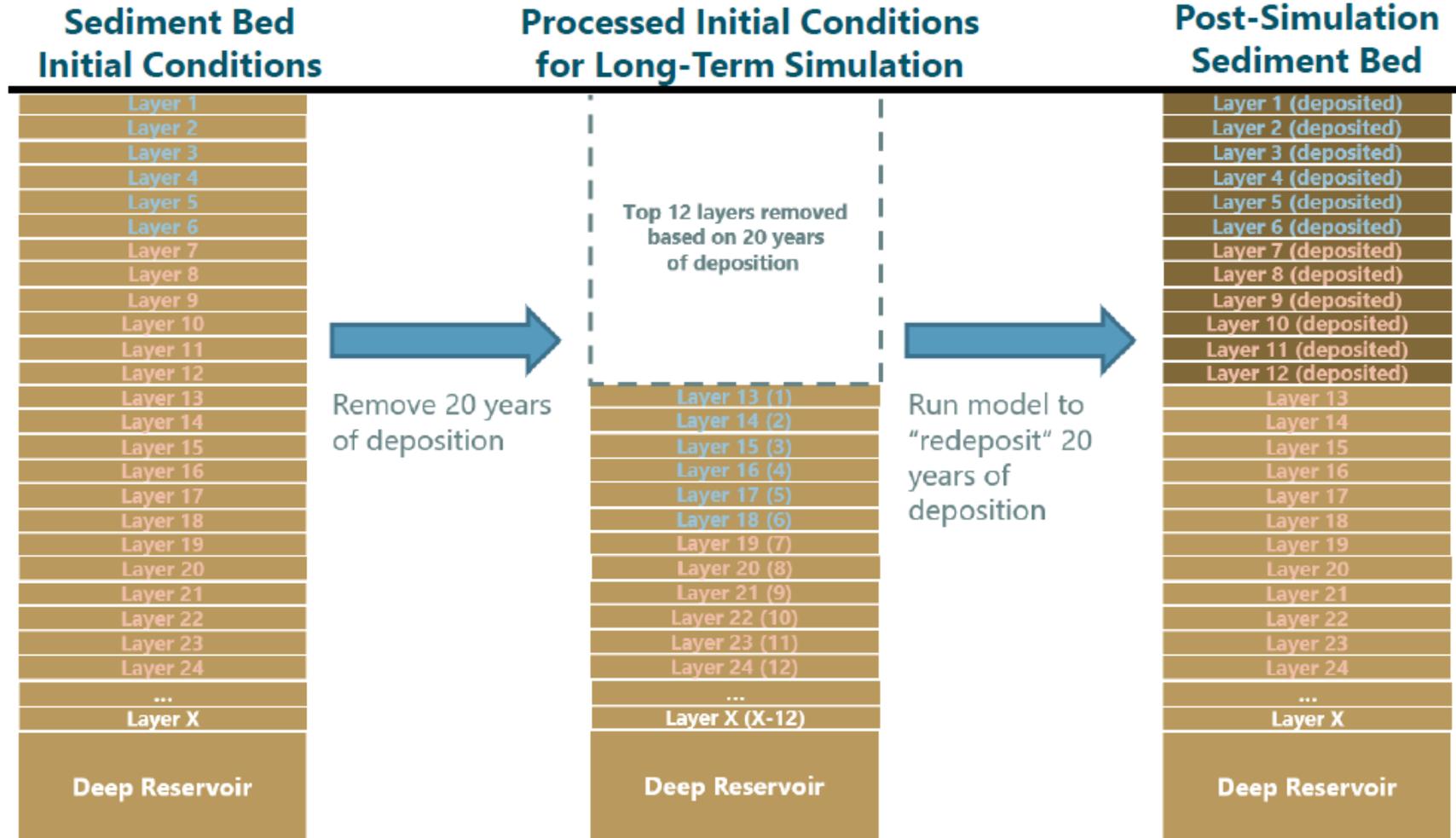
■ Upper English Kills

■ East Branch



MODEL CALIBRATION

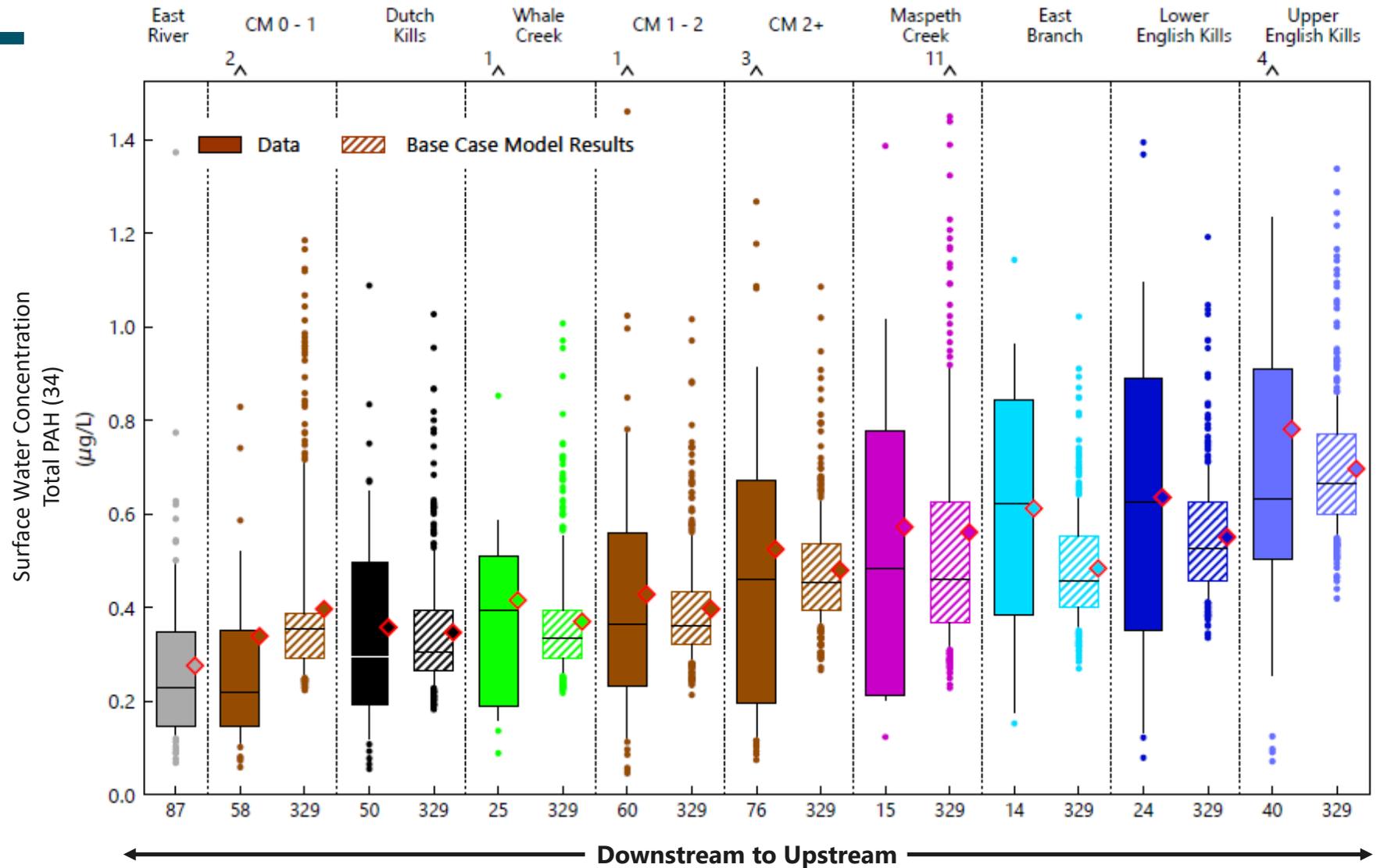
- Focused on surface water (**short-term**) and near surface sediment COC concentrations and vertical gradients (**long-term**)
- Validation included smaller datasets not directly incorporated into the model



20-Year Long-Term Calibration Via Hindcast

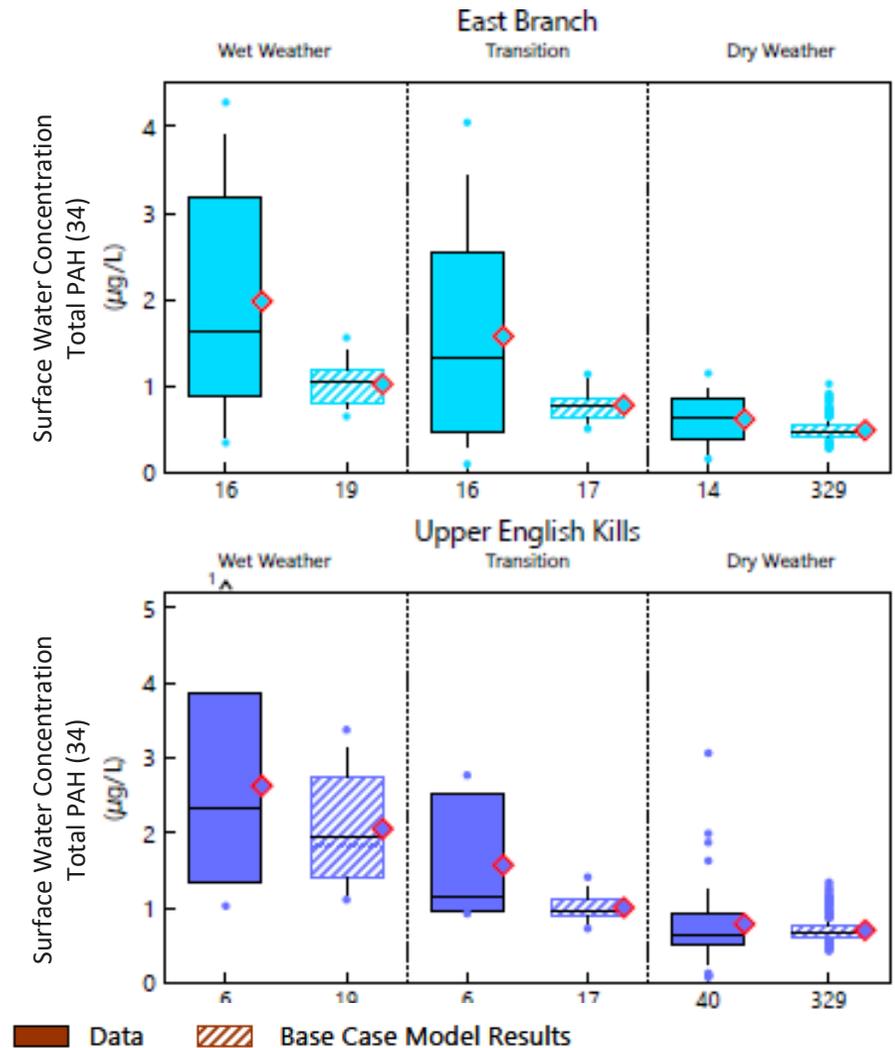
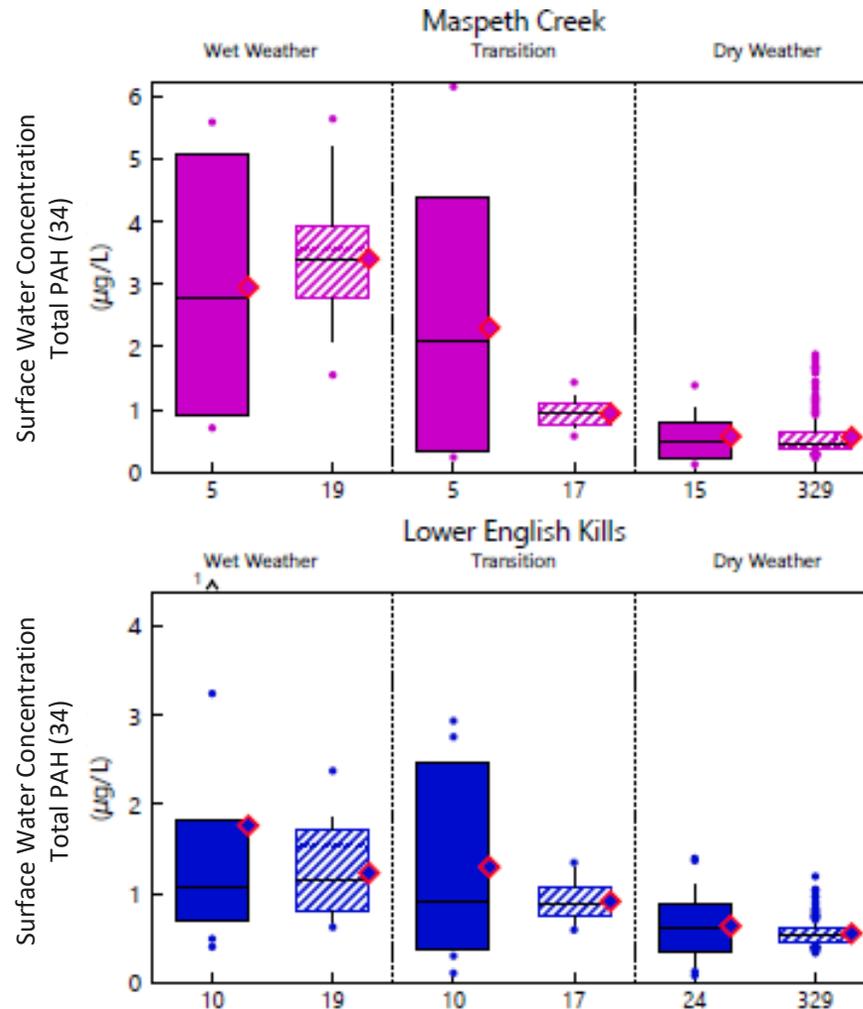
SHORT-TERM RESULTS

Box Plot Comparing Data and Model Results of Dry Weather Surface Water Concentrations by Reach for Total PAH (34)



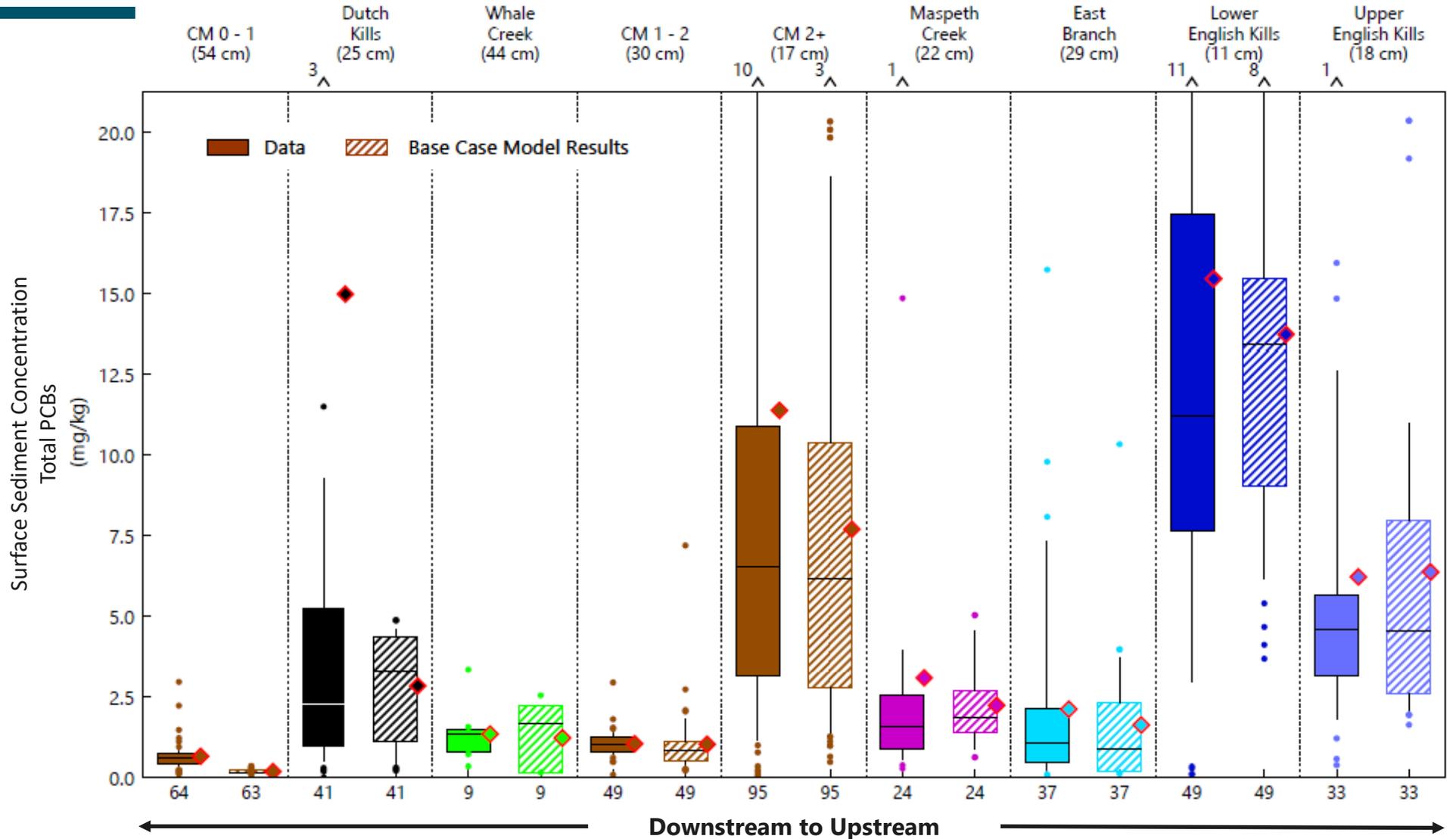
SHORT-TERM RESULTS

Box Plot Comparing Data and Model Results of Wet Weather, Transition, Dry Weather Surface Water Concentrations by Reach for Total PAH (34)



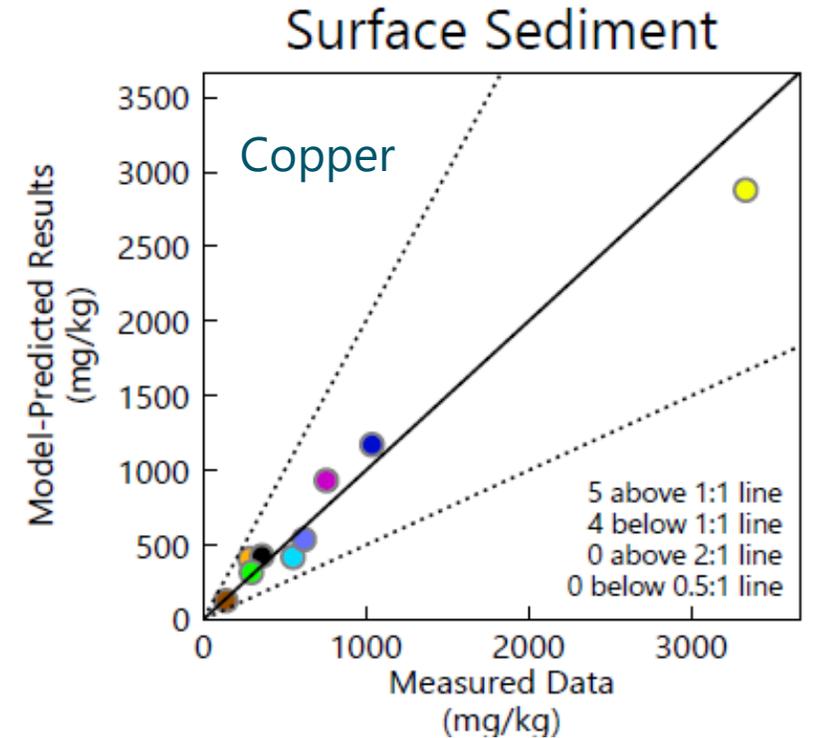
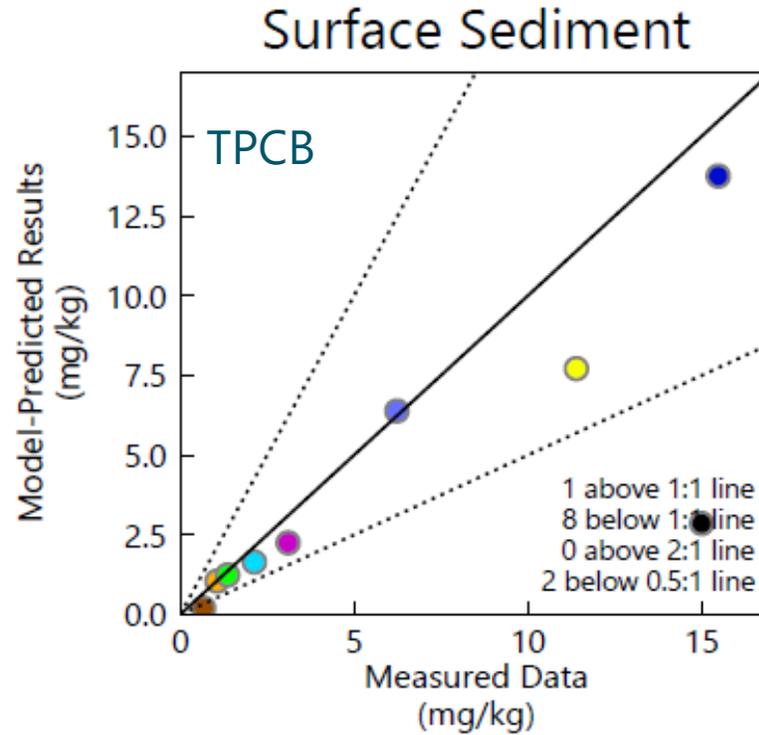
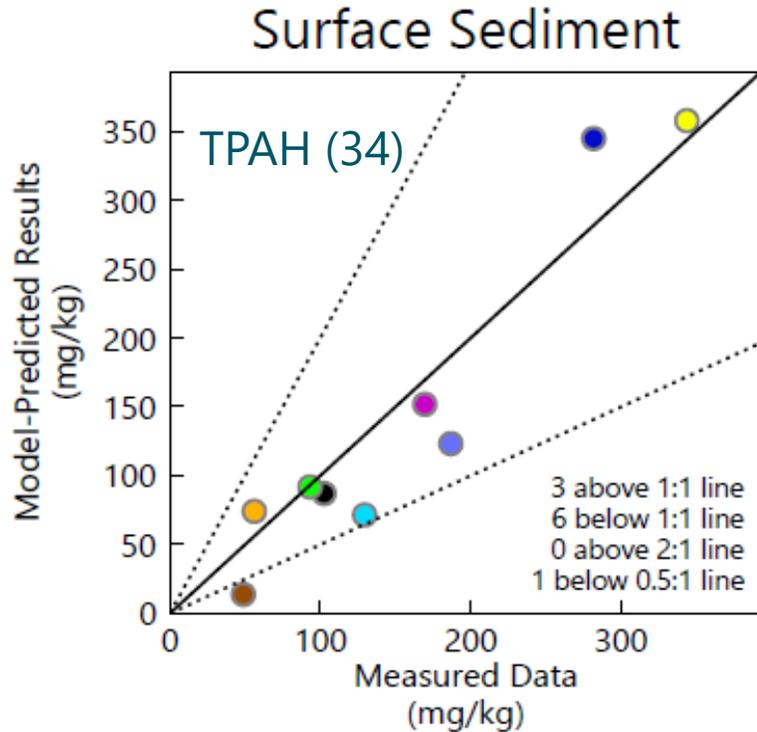
LONG-TERM RESULTS

Box Plot Comparing Data and Model Results of Surface Sediment Concentrations by Reach for Total PCBs



LONG-TERM RESULTS

Arithmetic Average Values

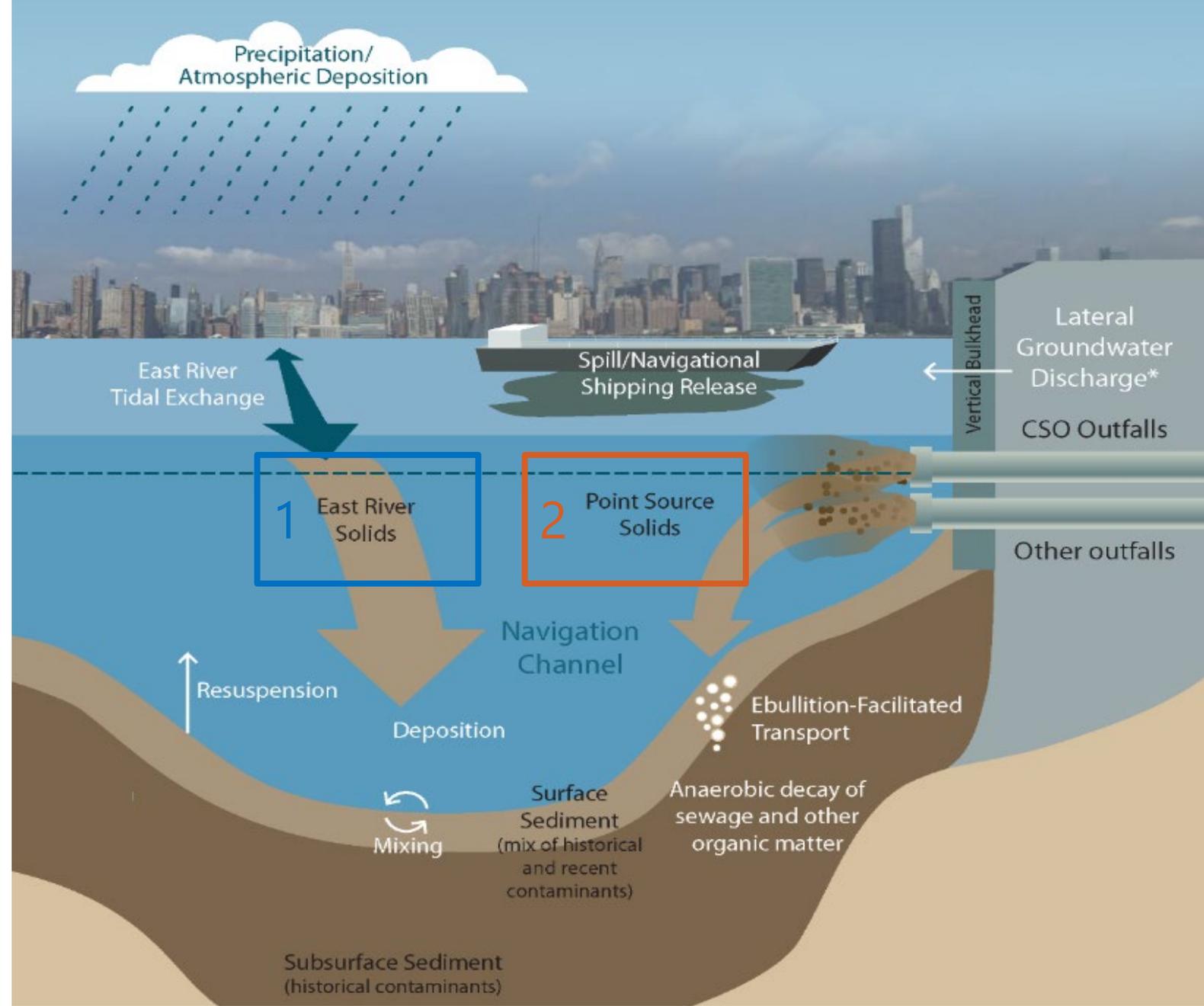


Cross Plots Comparing Model and Data Results of Surface Sediment for TPAH (34), TPCB, and Copper

BOUNDING CALIBRATION

Purpose: Develop a range of predictions to evaluate remedial alternatives during the FS

Approach: Uncertainty in the relative influence of two main sources, 1) **East River** and 2) **point sources**, was used as a key differentiator to define the two bounding simulations

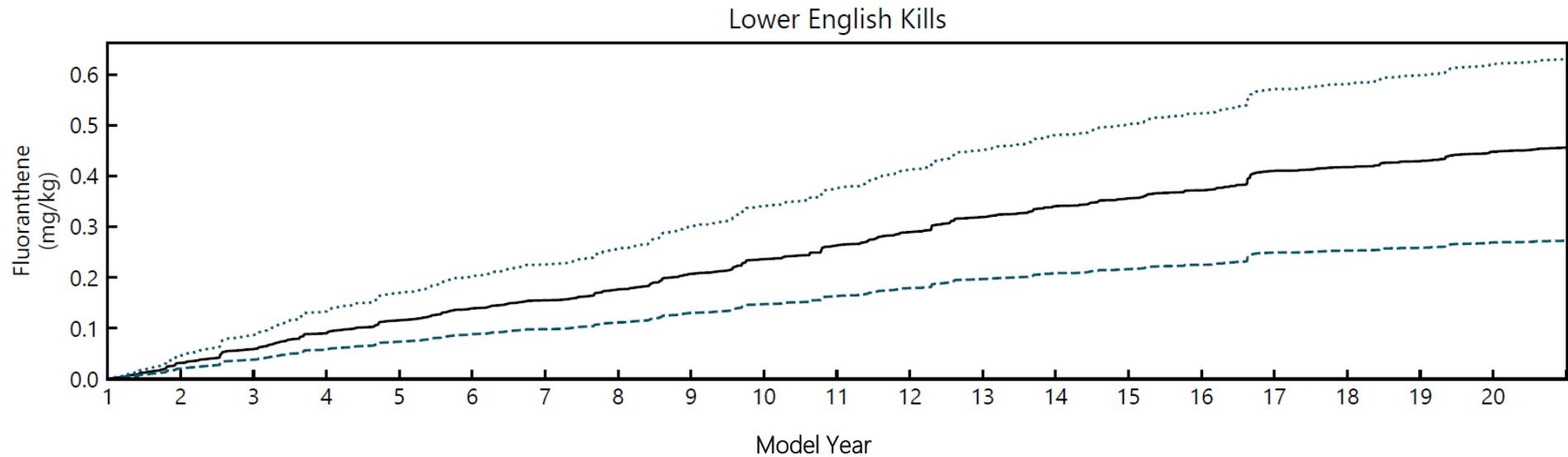
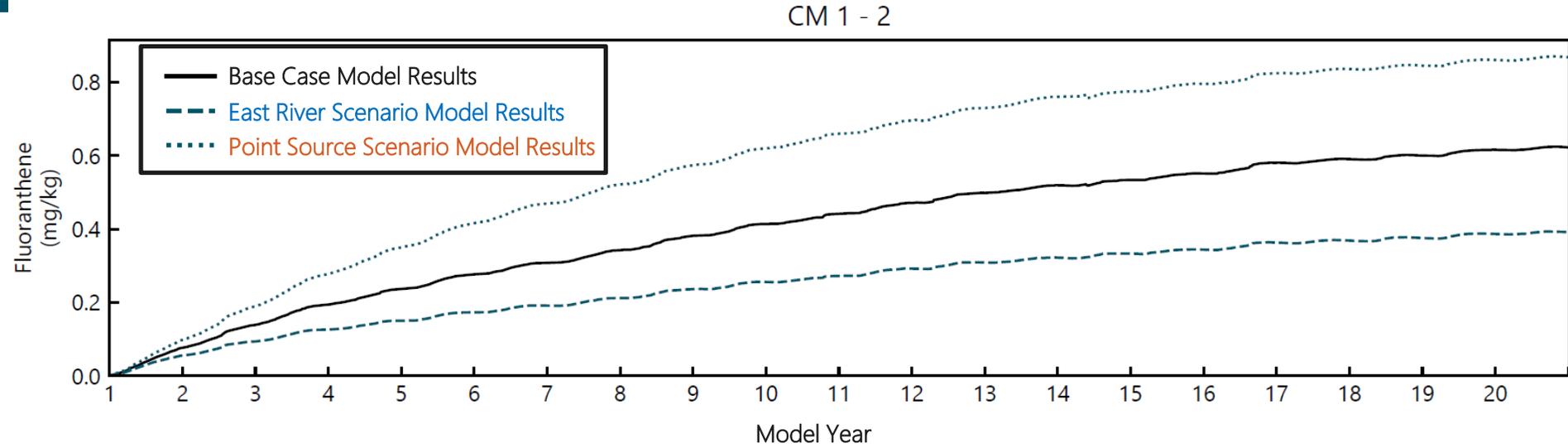


Scenario 1: more East River

Scenario 2: more point sources

SIMPLIFIED SIMULATION

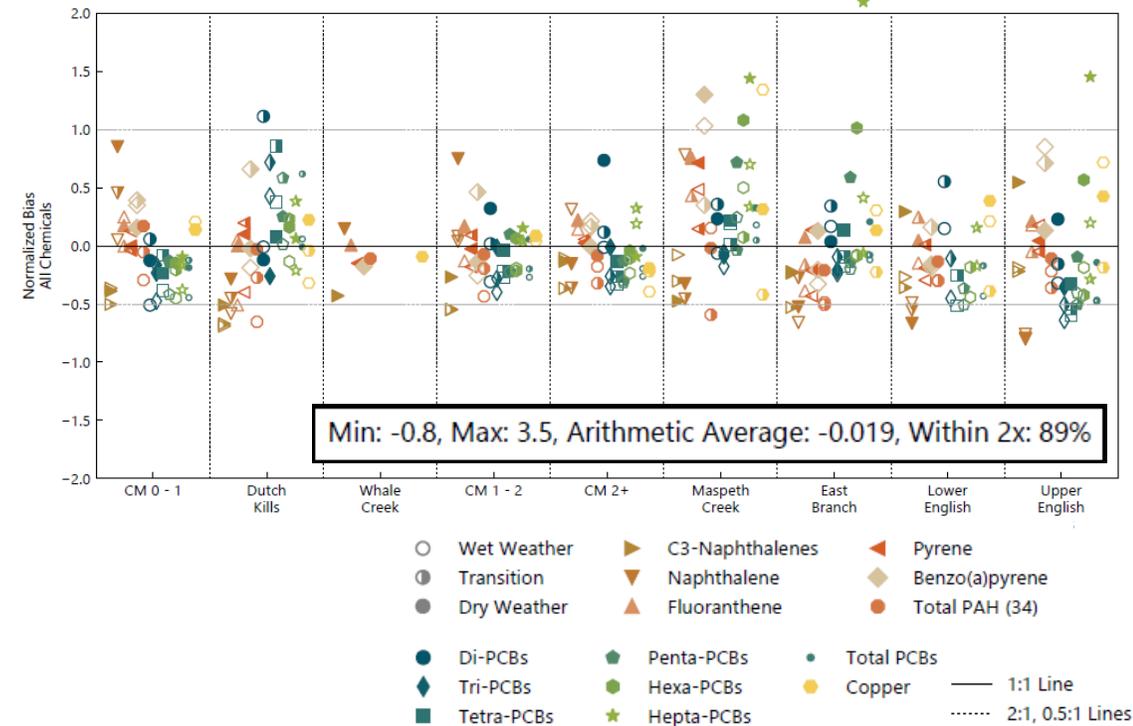
**Surface Sediment
Bed Temporal Plot
of Simplified
Simulation with
Sediment Bed
Initial Conditions
Set to Zero for
Fluoranthene**



A Robust Model

- Accurately simulates fate and transport processes and sources of COCs
- Successfully calibrated over a range of COCs with different:
 - Fate and transport properties
 - Sources and historical loads
 - Surface water concentrations over various weather conditions
 - Horizontal and vertical sediment concentration gradients

Surface Water Model Results by Reach, by Weather Condition, for all Contaminants



THANK YOU



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