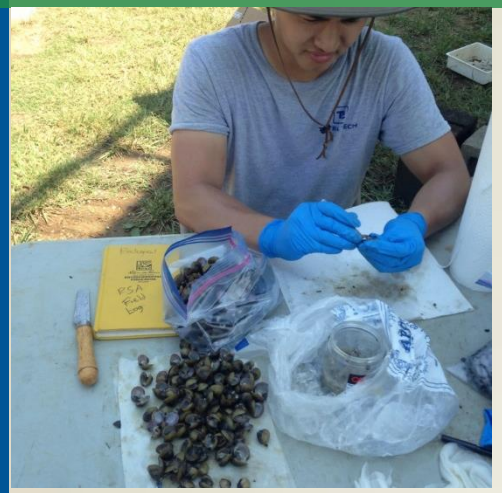
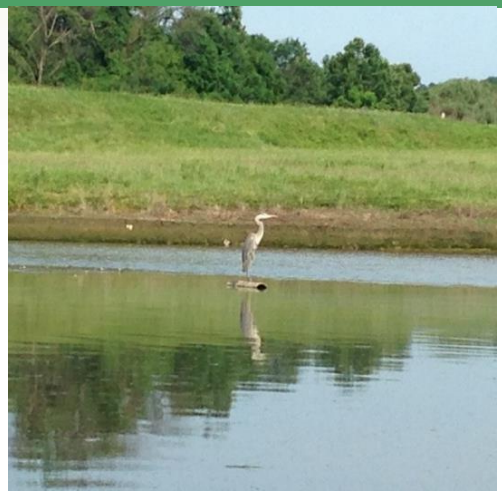



Anacostia River Sediment Project (ARSP) Human Health Risk Assessment Summary

Date **June 8, 2017**

DEPARTMENT OF ENERGY & ENVIRONMENT

NATIONAL PARK SERVICE

Agenda – HHRA Summary

- Conceptual Site Model
- Data Evaluation and Identification of COPCs
- Summary of final Phase 1 HHRA results
- Data Gaps
- Initial Remedial Action Objectives (RAOs) and Preliminary Remediation Goals (PRGs)
- Updated HHRA results
- Medium-specific PRGs
- Questions

Anacostia River – Site Features and Human Health Exposure Areas

Legend

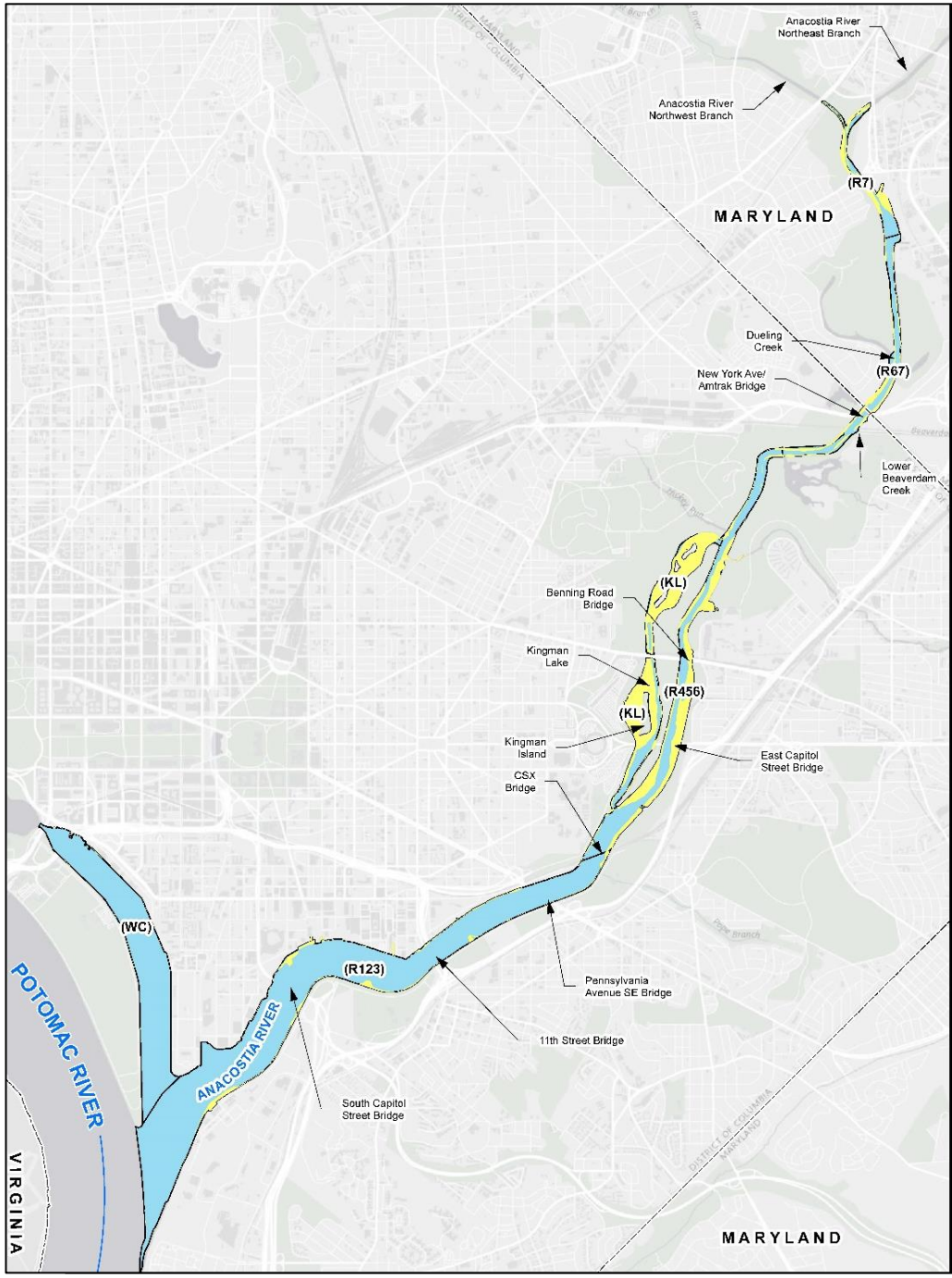
- FRINGE SEDIMENT - LOW TIDE MINUS ONE FOOT
- RIVER REACH
- WASHINGTON DC BOUNDARY

Legend

- CLEANUP SITE BOUNDARY (LAND BASED PORTION)
- SEDIMENT STUDY AREA
- WASHINGTON DC BOUNDARY

RIVER REACH

- (WC) - WASHINGTON CHANNEL
- (R123) - CSX BRIDGE TO MOUTH OF RIVER
- (R456) - NASH RUN TO CSX BRIDGE
- (R67) - BLADENSBURG MARINA TO NASH RUN
- (R7) - UPPER TIDAL LIMIT TO BLADENSBURG MARINA
- (KL) - KINGMAN LAKE



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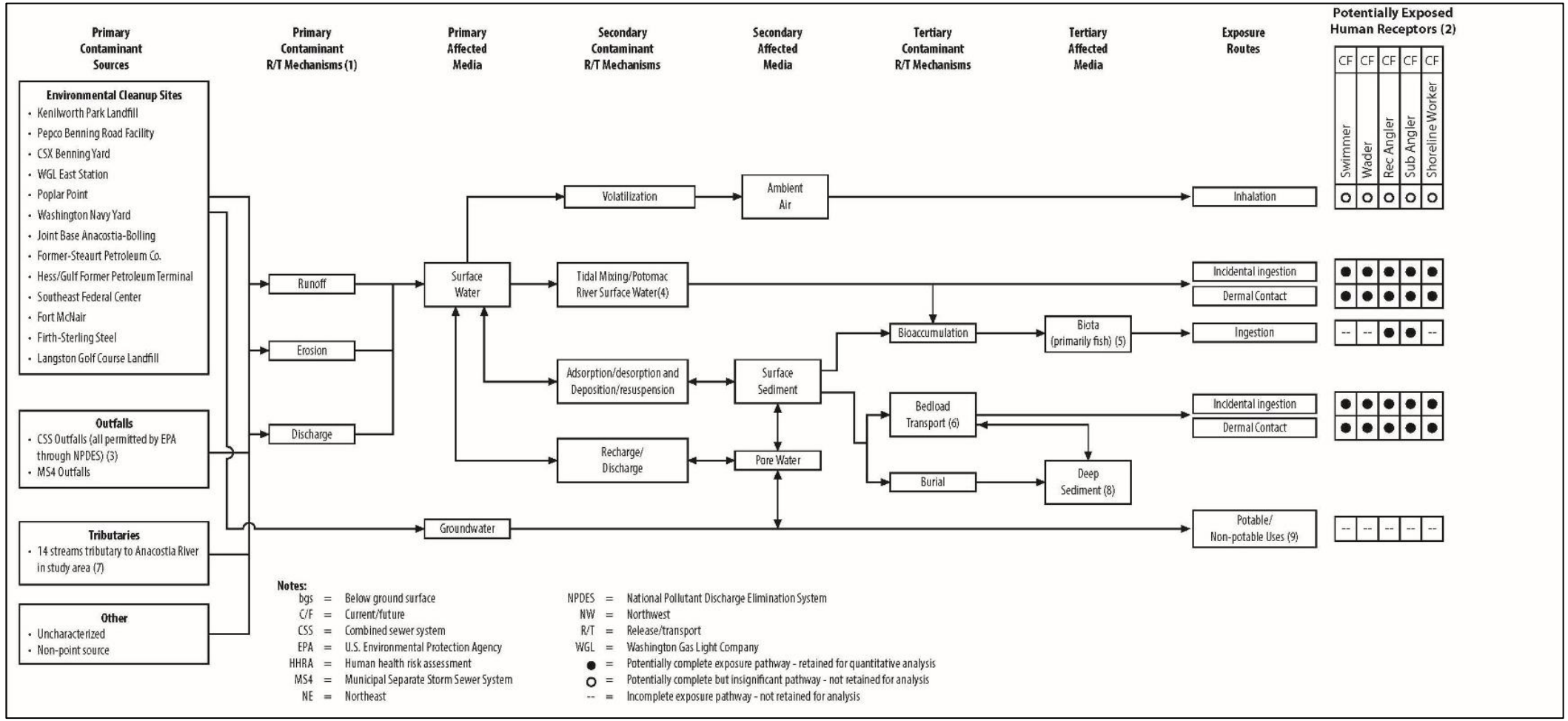
Anacostia River – Human Health Conceptual Site Model



Notes:

bgs = Below ground surface
C/F = Current/future
CSS = Combined sewer system
EPA = U.S. Environmental Protection Agency
HHRA = Human health risk assessment
MS4 = Municipal Separate Storm Sewer System
NE = Northeast
NPDES = National Pollutant Discharge Elimination System
NW = Northwest
R/T = Release/transport
WGL = Washington Gas Light Company
● = Potentially complete exposure pathway - retained for quantitative analysis
○ = Potentially complete but insignificant pathway - not retained for analysis
-- = Incomplete exposure pathway - not retained for analysis

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Human Health Conceptual Site Model

- Media of concern (sediment, surface water, and aquatic life [fish])
- Receptors (waders, swimmers, shoreline workers, and anglers)
- Potentially complete exposure pathways
  - Ingestion and dermal contact – sediment
  - Ingestion and dermal contact – surface water
  - Ingestion – aquatic life (fish)

Data Evaluation and Identification of Chemicals of Potential Concern (COPCs) and Chemicals of Concern (COCs)

- Data Evaluation
  - Data validation
  - Data usability
- Identification of COPCs
  - Use of medium-specific screening levels
  - Target risk of 1E-06 and target HI of 0.1
- Identification of COCs
  - EPA Target Cancer Risk Range- 1 in 1 million to 1 in 10,000 (1×10^{-6} to 1×10^{-4})
  - Non-carcinogenic risk hazard index (HI) greater than 1

Human Health Data Gaps Addressed in Phase 2

- Improve characterization of fish fillet concentrations in background
  - Dropped use of the MDE background set (relied on in Phase 1)
  - Added two background sets to compare to the tidal Anacostia River
    - Upstream (non-tidal) Anacostia River (DOEE sampled in Phase 2)
    - Potomac River (U.S. Fish & Wildlife [Pinkney] sampled in 2013)
- Characterization of whole fish tissue in Anacostia River
  - Reassessed and deleted this as a data gap (see Attachment 1 to Addendum 2 to the work plan)

Updated HHRA results include:

- Addition of new medium-specific data (river-wide characterization completed in Phase 2)
  - Phase 2 sampling
  - Additional PEC data
- Inclusion of outlier results
- Use of new background fish fillet data sets
  - Upstream Anacostia River
  - Potomac River
- EPA revisions to PAH toxicity (new benzo(a)pyrene toxicity factors)

Summary of Significant Human Receptor-Specific Risks – Phase 1

Fish Ingestion

- Risk and Non-cancer Hazard Drivers: PCBs, pesticides (carcinogenic risk driver-only), and arsenic
  - Downstream of CSX Bridge-Most Anglers (subsistence and recreational fishers)
    - Carcinogenic risk greater than 10-4 and non-carcinogenic hazard greater than 1.
  - Upstream of CSX Bridge- All Anglers
    - Carcinogenic risk between 10-6 and 10-4 and non-carcinogenic hazard greater than 1.

Sediment and Surface Water

- Risk Drivers: PAHs (sediment and surface water) Dioxins and dioxin-like PCBs (surface water only)
  - Carcinogenic risk greater than 10-6
  - There are no non-cancer hazard drivers associated with exposures to sediment and surface water.

Summary of Significant Human Receptor-Specific Risks – Phase 2 Update- Fish Ingestion

Anacostia River (Tidal) Risk Drivers: Dioxin like PCBs, total PCB, dioxins, pesticides (carcinogenic risk driver-only), and arsenic (downstream of the CSX Bridge only).

- Downstream of the CSX Bridge-
  - All subsistence and adult recreational anglers- Carcinogenic risk greater than 10-4 and non-carcinogenic hazard greater than 1.
  - Child and adolescent recreational anglers- Carcinogenic risk between 10-6 and 10-4 and non-carcinogenic hazard greater than 1.
- Upstream of the CSX Bridge-
  - Adult subsistence anglers -Carcinogenic risk greater than 10-4 and non-carcinogenic hazard greater than 1.
  - Child and adolescent subsistence and all recreational anglers -Carcinogenic risk between 10-6 and 10-4 and non-carcinogenic hazard greater than 1.

Potomac River (Background) Risk Drivers: Dioxin-like PCBs, total PCBs, pesticides, and arsenic

- All subsistence and recreational anglers- Carcinogenic risk greater than 10-4 and non-carcinogenic hazard greater than 1.

Upper Anacostia River (Non-Tidal Background) Risk Drivers: Dioxin-like PCBs, total PCBs, pesticides, arsenic, and mercury (child subsistence angler only)

- All subsistence and recreational anglers- Carcinogenic risk between 10-6 and 10-4 and non-carcinogenic hazard less than 1, except for child subsistence angler.

Summary of Significant Human Receptor-Specific Risks – Phase 2 Update- Sediment and Surface Water

Sediment Risk Drivers: Dioxins and dioxin-like PCBs

- Reach 456 -Carcinogenic risk between 10-6 and 10-4
  - Swimmers (future)
  - Shoreline workers (current and future)
- Risk less than 10-6 for all other reaches for all exposure scenarios.
- No significant non-cancer hazard associated with exposures to sediment.

Surface Water

- No significant cancer and non-cancer hazards associated with exposure to surface water.

Preliminary Draft Human Health Remedial Action Objectives (RAOs)

Receptors	Matrix	Preliminary Draft RAO
Human Health: Future swimmers, current/ future waders, current/ future recreational and subsistence anglers, and current/ future shoreline workers	Sediment	Prevent health risks to future swimmers, current and future waders, current and future recreational and subsistence anglers, and current and future shoreline workers from direct exposure via incidental ingestion of and dermal contact with contaminated sediment during the representative activities conducted by each of these receptor subgroups.
Human Health: Future swimmers, current/ future waders, current/ future recreational and subsistence anglers, and current/ future shoreline workers	Surface water	Prevent health risks to future swimmers, current and future waders, current and future recreational and subsistence anglers, and current and future shoreline workers from direct exposure via incidental ingestion of and dermal contact with contaminated surface water during the representative activities conducted by each of these receptor subgroups.
Human Health: Current and future recreational and subsistence anglers	Surface water	Reduce concentrations of COCs in fish to levels safe for unlimited human consumption.
Human Health: Current and future recreational and subsistence anglers	Sediment	Reduce concentrations COCs in fish to levels safe for unlimited human consumption.

Phase 2 Revisions to Draft Medium-Specific Preliminary Remediation Goals (PRGs)

- Phase 2 sample additions and procedure modifications
  - Additional sampling of most contaminated areas
  - New fish background data sets and additional sediment background samples
  - Incorporation of additional non-DOEE data sets (e.g., Washington Navy Yard)
  - Incorporation of outlier results
- PRG revisions were moderate (one primary exception – see below) and related to possible revised medium-specific COCs
- Most significant impact related to PAHs in sediment:
  - New benzo(a)pyrene toxicity factors – reduced toxicity factors
  - Focused on benzo(a)pyrene equivalence
  - Increase in carcinogenic PAH PRG
  - Reduced extent of sediment above PAH PRGs

Calculation of Medium-Specific Preliminary Remediation Goals

- Medium-specific COCs (based on Phase 2 results)
- Back-calculated using site-specific exposure assumptions (RAGS Table 4s) and toxicity factors (RAGS Table 5s and 6s)
- Target risk of 1E-06 and target HI of 1
- Example forward risk calculation:

$$Risk = (C \times CR \times EF \times ED/BW \times AT) \times SF$$

- Set risk = 1E-06 and solve for C (referred to as exposure point concentration [EPC] in forward calculation and preliminary remediation goal [PRG] in back-calculation)
- Example PRG calculation (from above):

$$C \text{ (or PRG)} = (1E\text{-}06 \times BW \times AT)/(CR \times EF \times ED \times SF)$$

Questions?

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