CERCLA: Remedial Design, Remedial Action, and Beyond

What is CERCLA?

- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
- Enacted in 1980
- Goals
  - To identify and cleanup contaminated sites
  - Risk reduction, focused on protecting human health and the environment

The Process

- **Site Listing on National Priorities List (NPL)**
- **Remedial Investigation (RI)**
- **Feasibility Study (FS)**
- **Record of Decision (ROD)**
- **Remedial Design (RD)**
- **Remedial Action (RA)**
- **Post-Remediation Monitoring**
- **Site Closeout**
- **Deletion from the NPL**

Steps in RD/RA

Remedy Selected -- Record of Decision

Remedial Design

- Pre-design investigation
- Pilot studies/testing
- Engineering design

Remedial Action

- Mobilization
- Construction/implementation (e.g., excavation, treatment)
- Performance testing

Site Closeout

- Monitoring, O&M, Institutional Controls
- Deletion from the National Priorities List (NPL)

Legal & Technical Issues

- Who performs the work?
- Who pays for the work?
- What are the goal posts?
- How long will it take?
- Where do you need access?
- When do you have to do more?

CERCLA: Remedial Design Considerations

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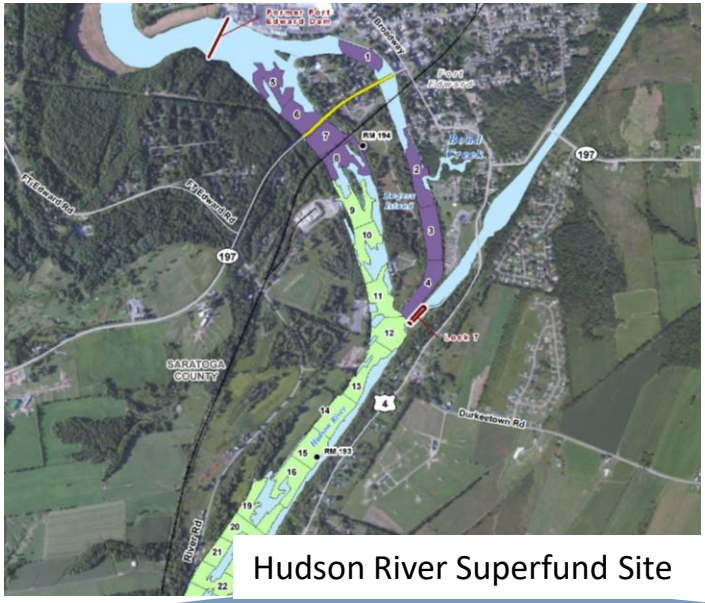
Superfund Sediment Site Design Considerations

- Site Characterization and Analysis
- Sources Controlled
- Physical, Geotechnical, and Hydrodynamic Factors
- Ecological and Mitigation Considerations
- Engineering Feasibility and Design
- Remediation Technology Selection
- Regulatory Compliance
- Contractor Procurement and Contracting
- Implementation and Oversight
- Monitoring and Maintenance
- Stakeholder Considerations

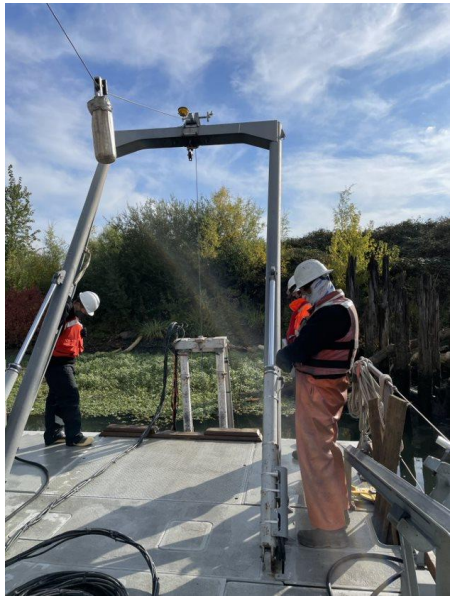
Design Considerations – Impacts to Completion

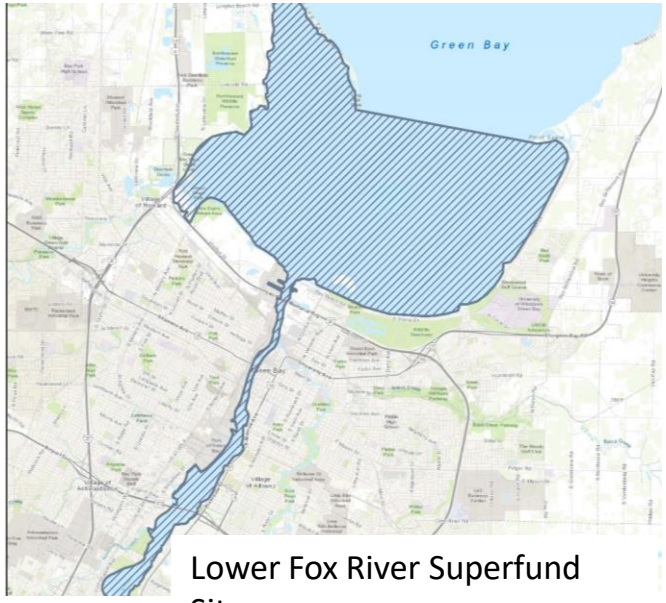
- Lessons learned from past sites:

  "You can't have too much data going into design…"



Hudson River Superfund Site





Lower Fox River Superfund Site

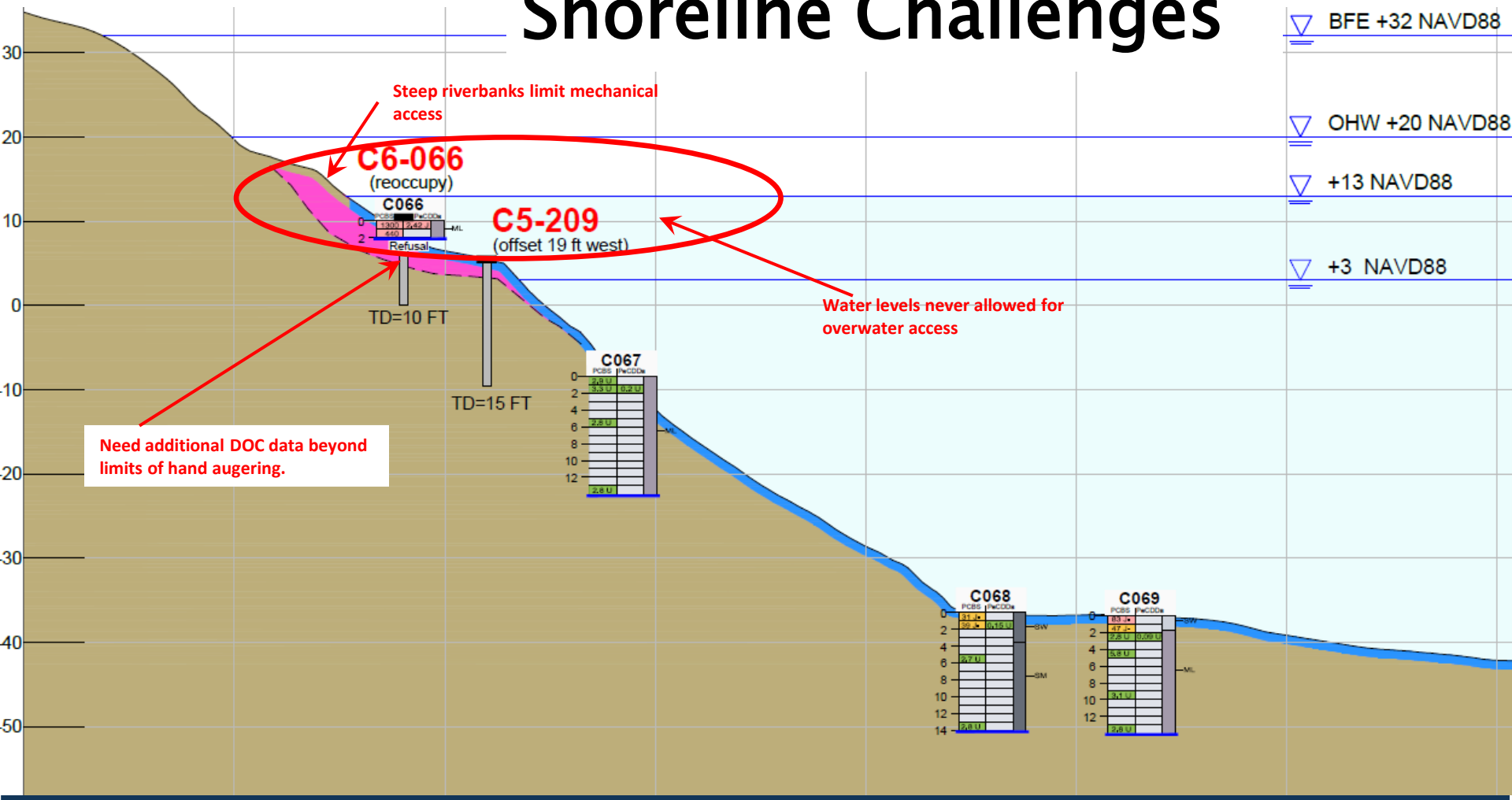
Common Sampling Challenges for Project Areas

- Water Levels: Data is needed where elevation zones are minimally inundated.
- Debris and Armoring: Impediments to collecting data at intended locations.
- Structures: Sample locations needing shifted to avoid structures or piling. May limit ability to bound/delineate contamination.
- Sampling Technology Limitations: Equipment options are limited and have pros and cons to each.

PHSS Project Area Specific Sampling – Impacts to Schedule

- Sampling Locations between +10 and +13 NAVD88:
  - No freshet occurred to allow for overwater access to locations.
  - Steep banks prevent placement of drill rig.
  - Heavy debris and armoring limit hand methods.
- Facility Operations: Limited timeframes to access areas behind and below docks.
- Dense Substrate: Limits available technologies and require multiple sampling methods.
- Step-out Sampling: Despite program sampling density, data results identified additional step-out locations.

Shoreline Challenges



Implications on Sampling Program

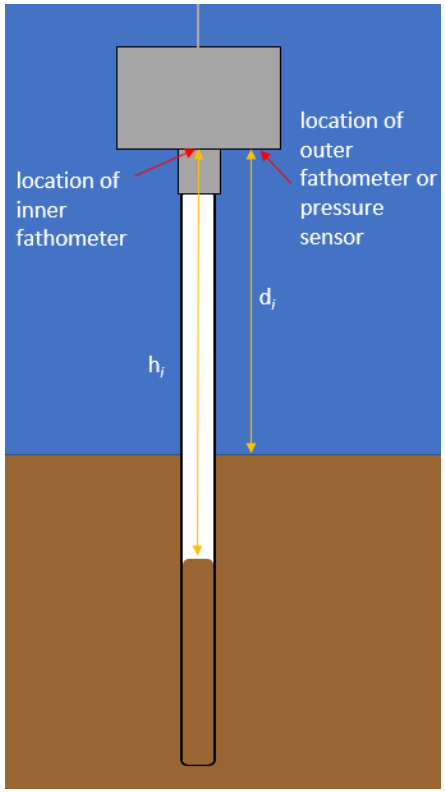
- Innovative technologies ("thinking outside the box") required to collect all data
- Additional time needed to collect sufficient data for RD => Design implications until data is collected
- Sampling program costs increase
- Over-reliance on assumptions for data gaps reduces design confidence

Some Techniques We've Implemented to Get Better Design Data

- Incremental data collection through monitoring sediment acquisition during vibracoring (VSAM)
- Manual and modified approaches for limited access areas
- Increased density due to heterogeneity and to reduce unknowns

Vibracoring Sediment Acquisition Monitoring (V-SAM)

- Measures incremental depth to mudline inside and outside of core tube
- Incremental depth of penetration (di) and incremental headspace (hi) are recorded at various stages through the drive, typically in 1’ to 3’ intervals
- At start of drive, hi = L tube with adjustments for location of fathometer
- Incremental L and H are calculated from obtained values



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Conceptual Case Study: Portland Harbor Superfund Site

- Conceptual project area along the PHSS was selected for study
- Comparison between historical subsurface sediment data that used conventional vibracore methods and more recent data that used V-SAM
- Project area includes off-channel quiescent area and an area along the main channel of the Willamette Waterway

Discussion of Differences in EOC

- 10 out of 11 samples in slip underestimated the EOC
  - More unconsolidated fine sediment at surface
  - The one sample that deviated from this was primarily classified as clay
- All 3 samples along the channel overestimated the EOC
  - More bed shear; less unconsolidated fine sediment
  - Potentially a greater impact of the intervals with >100% recovery

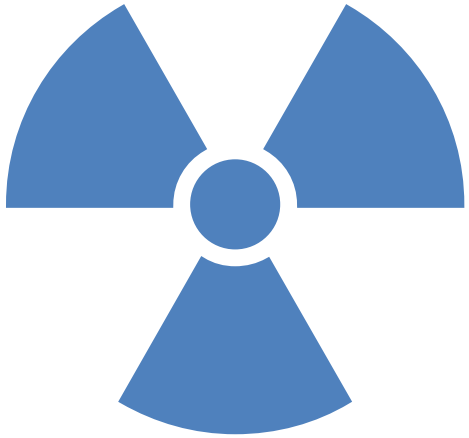
Potential Effects on Remedial Design Schedule and Costs

- 80,000 CY of missed sediment…
  - Recharacterization of project area
  - Redesign/re-mobilization
  - 40 barges of sediment
  - SCHEDULE!

- 184,000 CY of overdredged sediment…
  - At $160 per CY for transload, transport and disposal at Subtitle D landfill, ~$29M

got data?

The Quest for Site Closure



- Finite destination, or to infinity and beyond?
- Changes in law, environment, science

➢ New regulatory developments
  - PFAS
  - 1,4,-dioxane risk evaluation
  - Lead risk levels

Case studies

- Fox River – Contractor dispute
- Gowanus – Work in phases
- Hudson River – Remedy under performing
- Koppers Oroville Wood Treatment - TI Waiver
- Coakley Landfill - Emerging contaminant

Fox River, WI

Figure 1. Lower Fox River PCB-Contaminated Sediment Deposits and
Units

Fox River

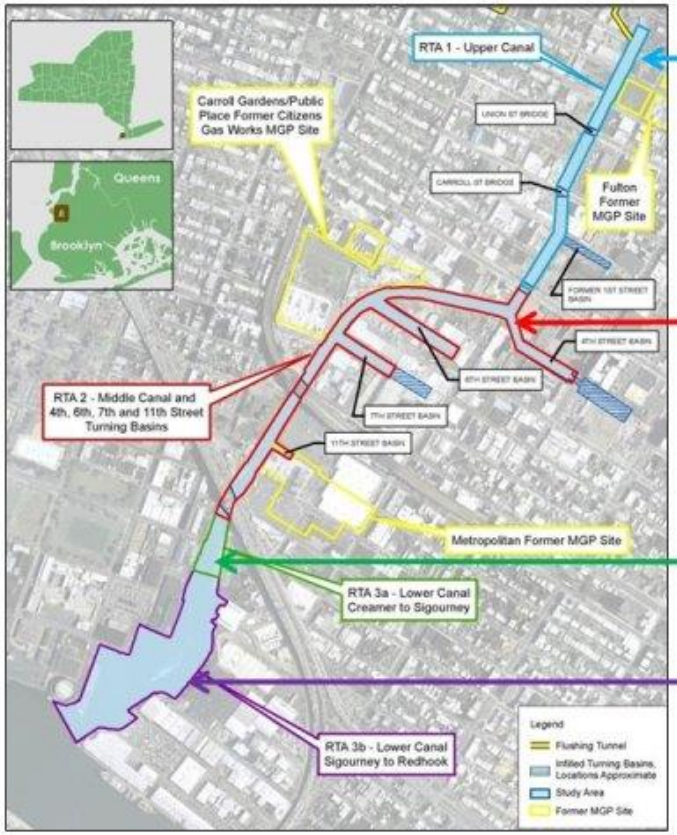
- **1998 Proposed for NPL**
- 2002 ROD for OU 1 & 2
- 2003 ROD for OU 3-5
- 2006 Phase 1 RA CD, under interim allocation
- 2007 ROD Amendment for OU 2-5
- 2007 UAO to 8 private parties to implement phase 2 RA at OU2-5
- 2008 ROD Amendment for OU 1
- 2008 Litigation filed
- 2010 Explanation of Significant Differences (ESD)
- 2010 OU1 construction completion
- 2010 & 2014 Cash-out CDs
- 2017 CD for performance at multiple OUs
- 2019 Performance CD for O&M and LTM
- 2022 OU2-5 construction completion
- **2024** Fourth five-year review. PCB levels have not yet dropped to cleanup standards

Fox River

- Remediation Contractor Dispute
  - 2017 Dispute with remediation contractor over contract terms, headed to arbitration. Contractor claims $46m-53m.
  - Arbitration concludes in 2019, contractor awarded $10m
- Contractor Revenue
  - Dredging services held taxable income by WI Supreme Court in 2018

Gowanus Canal, NY

Remediation Target Areas (RTAs)



RTA 1
Upper Canal
Intermediate level of contamination

RTA 2
Middle Canal
Highest level of contamination

RTA 3a
Lower Canal
Lowest level of contamination, shallower

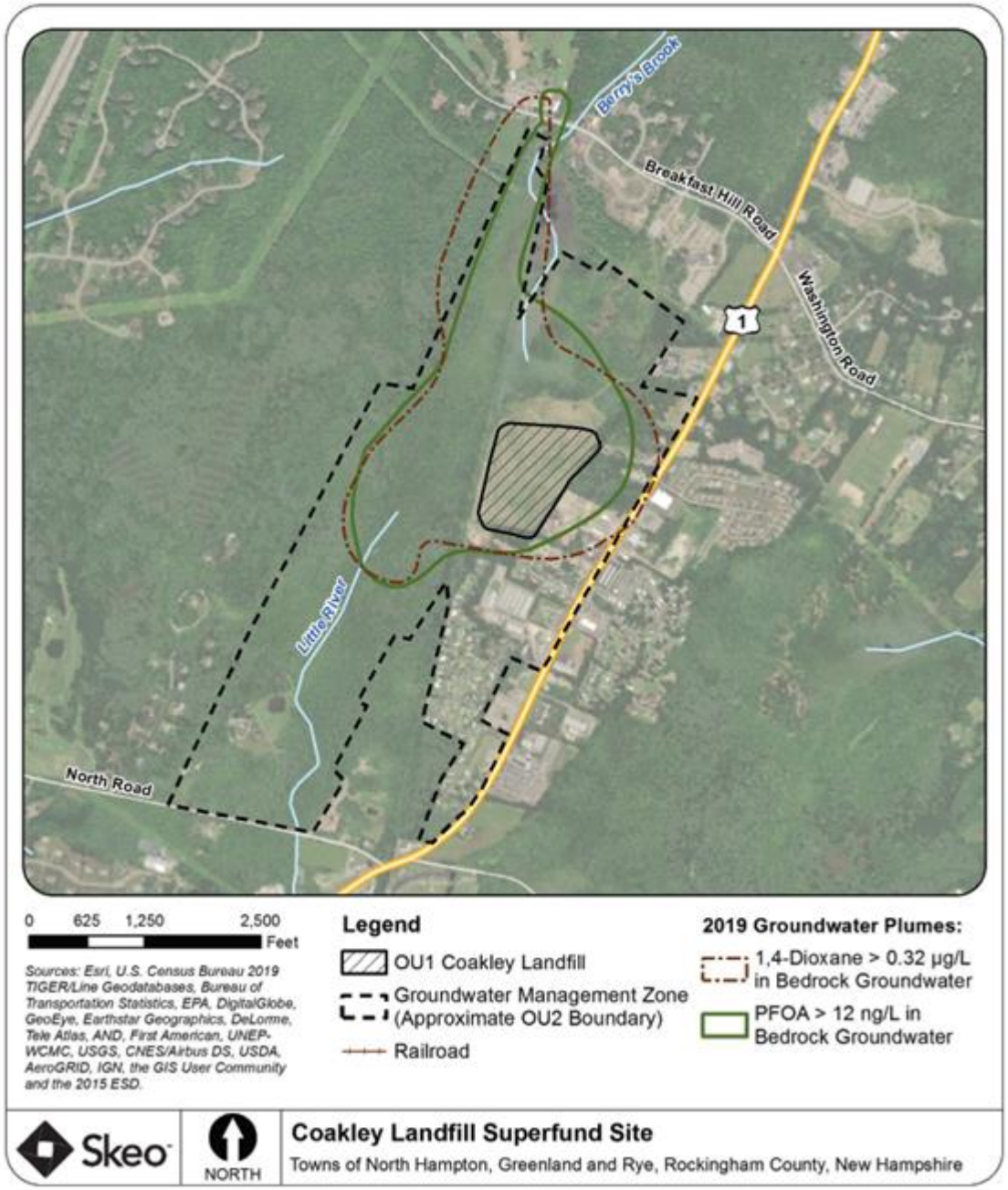
RTA 3b
Lower Canal
Lowest level of contamination, deeper

Gowanus Canal Superfund Site

- 2010 NPL list
- 2013 ROD, divides canal into three segments
- 2014 UAO to more than 30 parties
- 2016 Debris removal test
- 2017-2018 test dredging
- 2018 test capping
- 2020 source control cutoff wall installed
- 2020 design for RTA1 and 2 begins
- 2021 UAO to city to implement CSO controls
- 2024 dredging and capping of RTA 1 complete
- 2024 UAO amended to cover RTA 2

Coakley Landfill, NH

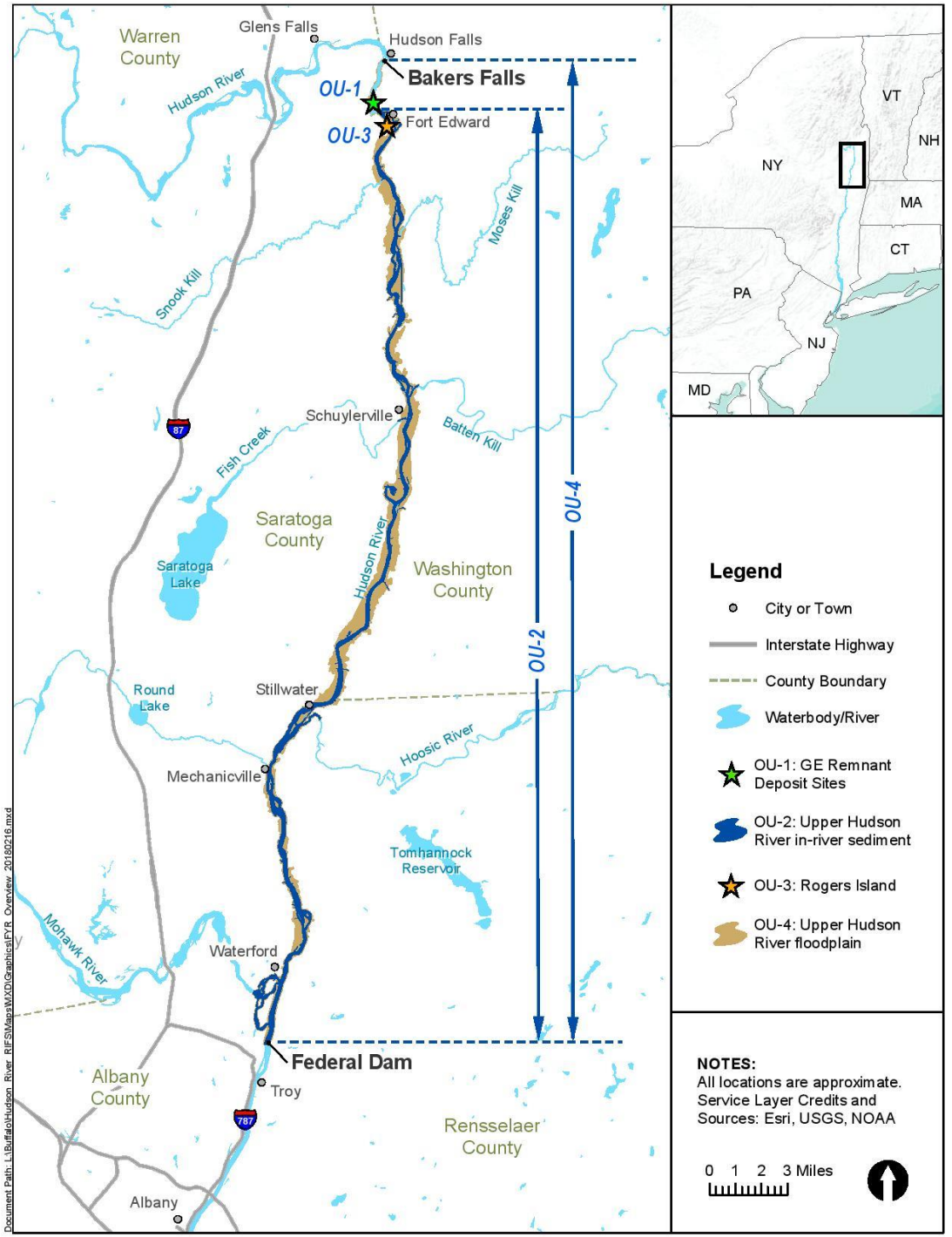
Figure 2: Institutional Control Map



Coakley Landfill Superfund Site

- 1986 listed on NPL
- 1990 ROD OU1 source control
- 1991 ESD
- 1992 CD for OU1 RD/RA
- 1994 ROD OU2 groundwater migration
- 1996 ESD
- 1999 OU1 construction completion
- 1999 CD for implementation of OU2 remedy (monitoring)
- 1999 ESD
- 2007 ESD requires establishment of groundwater mgmt. zone (GMZ)
- 2009 ESD
- 2015 ESD GMZ expanded due to 1,4, -dioxane
- 2016 Investigates for PFAS, 1,4,-dioxane
- 2021 Fifth five-year report
- 2024 EPA updates site specific screening levels for PFAS in surface water and sediment at the Site

Hudson River, NY



Hudson River PCBs Superfund Site

- 1984 Listed on NPL, but concluded “No Action” for much of the site
- 1984 ROD for OU1
- 1989 New York State petitioned the EPA to revisit its decision
- 1991 OU1 capping complete
- 2002 ROD, site broken into “certification units”
- requiring GE to dredge PCB-contaminated sediment from 40 miles of the Upper Hudson River.
- 2003 AOC for remedial design
- 2005 CD for Phase 1 remedial action
- 2007, 2008 Floodplain AOCs, removal & sampling
- 2008 Access Order to allow construction of water lines for alternative drinking water source
- 2009 CD amendment for water supply costs
- 2009-2015 GE dredged approximately 2.75 million cubic yards of contaminated sediment.
- 2011 settlement for phase 2
- 2014 Floodplain RI/FS AOC
- 2019 Construction complete for phase 1 and 2 remedial action (“work” completion not for 50 years)
- 2022 ASAOC for investigation of Lower Hudson
- 2024 Draft third five-year review
- Community meeting tomorrow to go over PCB trends and the draft five-year review

Koppers Oroville Wood Treatment Facility, CA

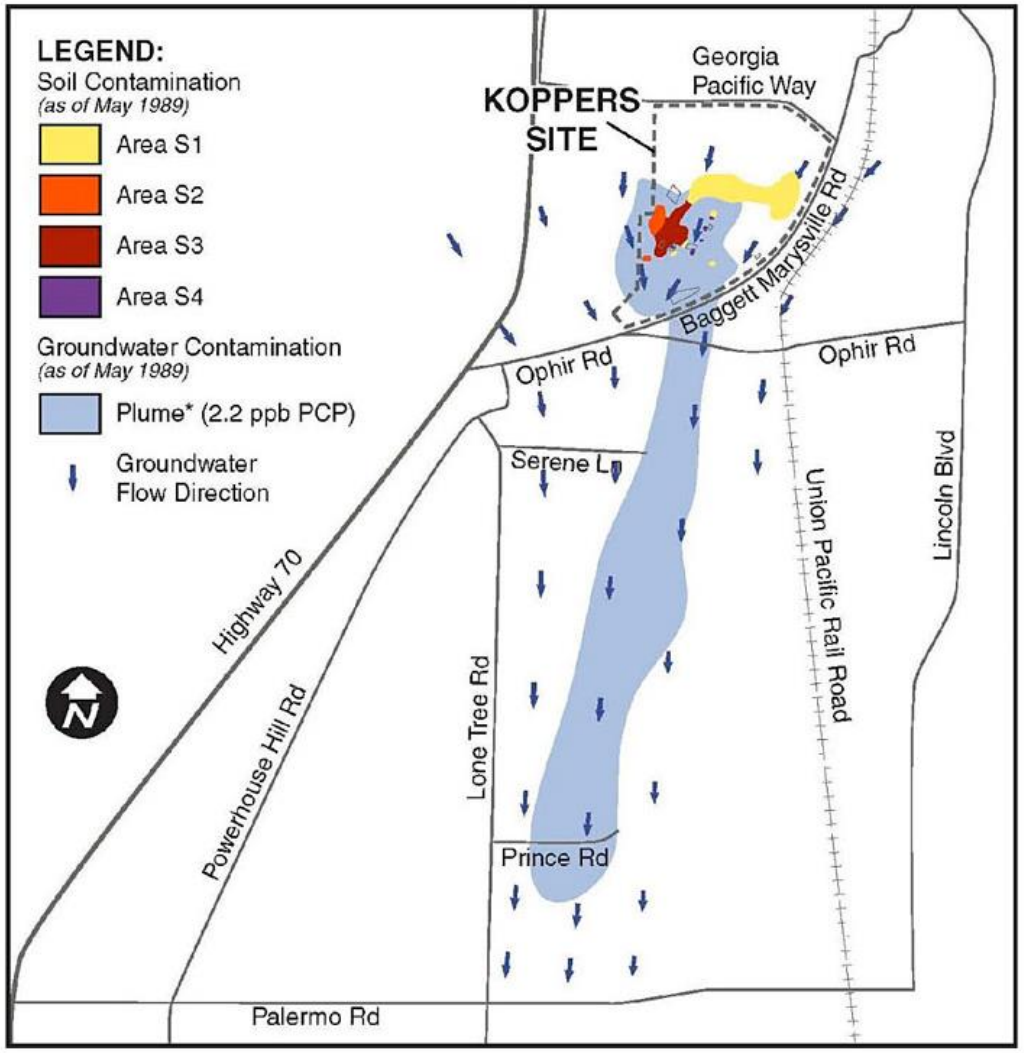


Figure 8. Soil and groundwater units, former Koppers Oroville Wood Treatment Facility (USEPA 2013a).

Koppers Oroville Wood Treatment

- 1980s investigation began
- 1989 ROD
- 1991 ESD
- 1990s Pilot testing
- 1996 ROD Amendment 1
- 1999 ROD Amendment 2 (TI waiver & contingent remedy)
- 2003 Construction completion
- 2013 Off-property groundwater monitoring ceased

- On-site groundwater remediation system operating until cleanup standards are met
- 44 years of work, still ongoing

TI Waiver (groundwater)

Figure 1: EPA TI Waivers by Fiscal Year (FY 1988 – 2011)

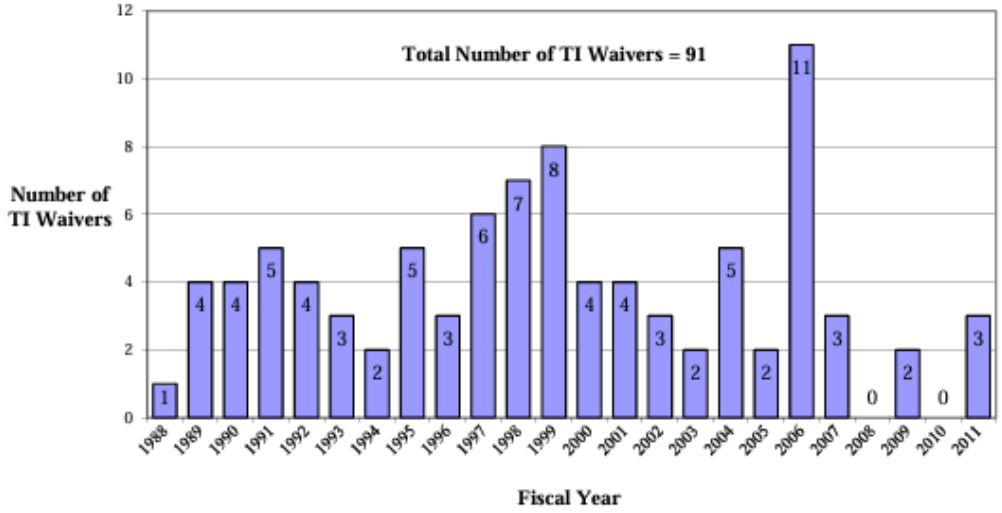
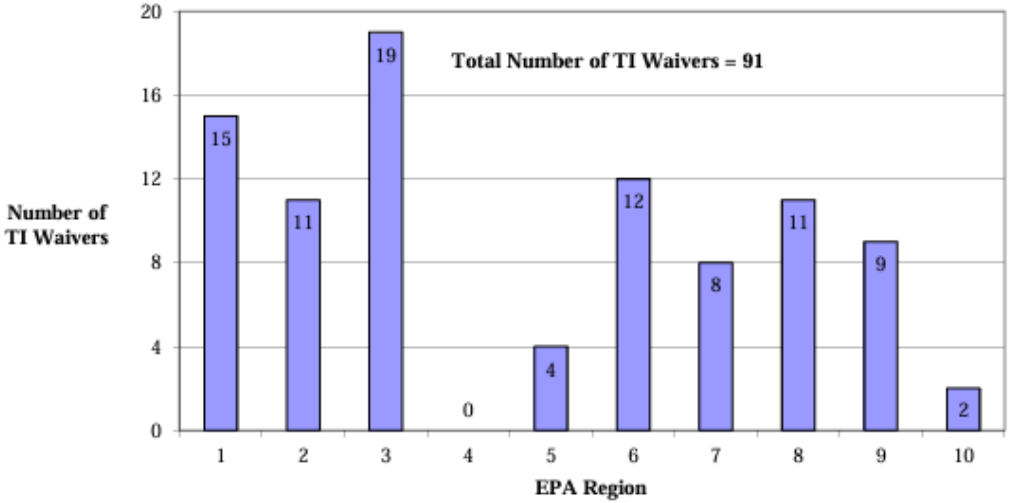


Figure 2: TI Waivers per Region (FY 1988 – 2011)



A Tale of Two Superfund Sites:

Portland Harbor

and

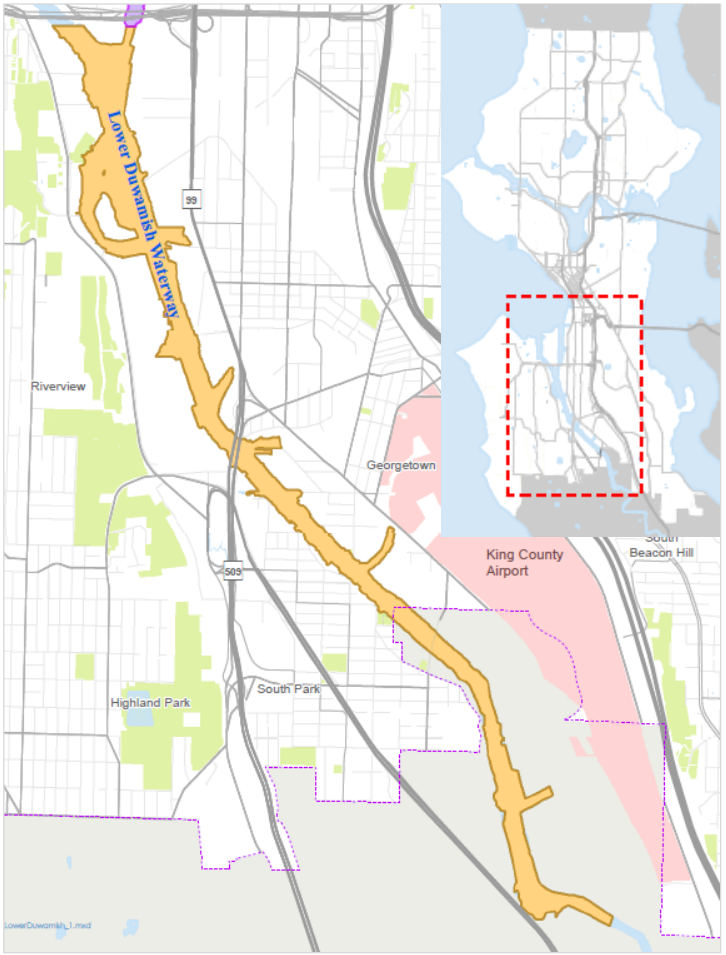
Lower Duwamish Waterway

Presented by
Amanda Shellenberger
12/11/2024

ANCHOR QEA

Lower Duwamish Waterway ROD

- ROD Remedy: $342 million Net Present Value (NPV)
  - Active cleanup: 177 acres
    - Dredge: 105 acres
    - Capping: 24 acres
    - Enhanced Natural Recovery (ENR): 48 acres
  - Monitored Natural Recovery (MNR): 235 acres
- Remedial Design implemented by Lower Duwamish Waterway Group (LDWG: City of Seattle, King County, and Boeing)
  - 1 AOC for each reach (Upper, Middle, Lower)
- Remedy Action for Upper Reach implemented under a unilateral administrative order (UAO) with LDWG in advance of Consent Decree for site



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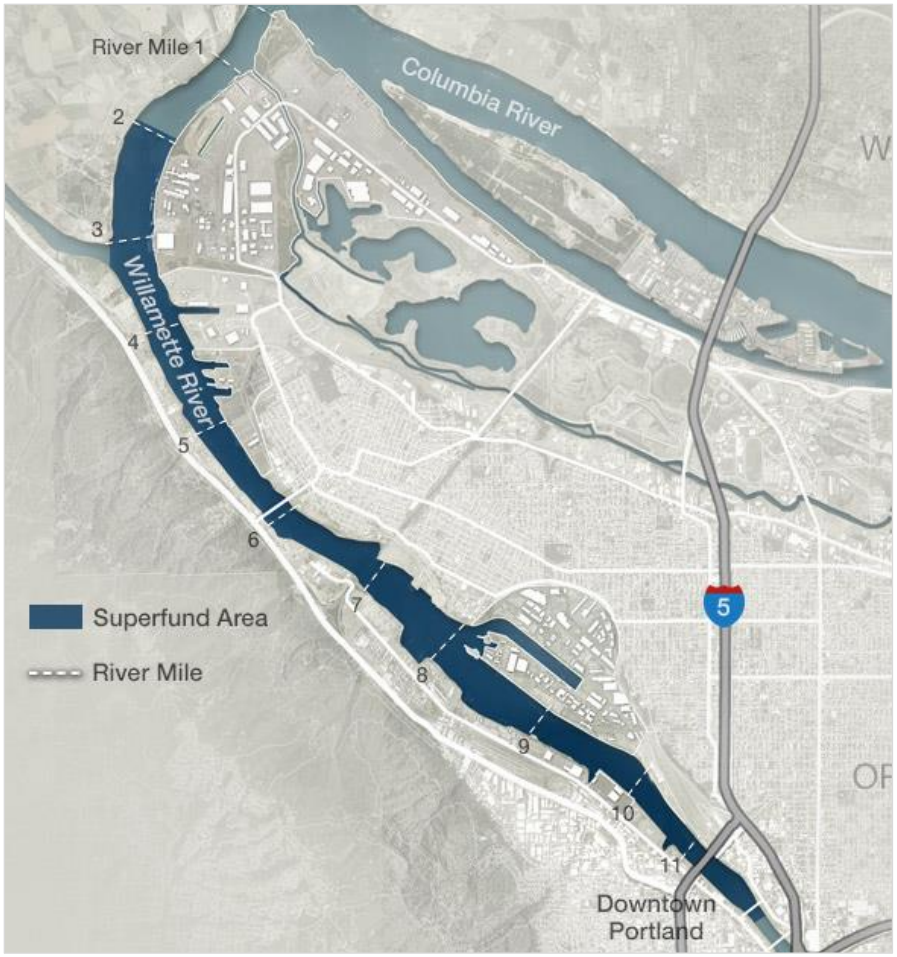
Portland Harbor ROD

- ROD Remedy: $1.05 billion NPV
  - Active Cleanup: 394 acres
    - Dredge: 215 acres
    - Capping: 150 acres
    - ENR: 28 acres
  - MNR: 1,774 acres
- Remedial Design being implemented by multiple different parties at 17 project areas plus orphan sites (many AOCs)
- Remedial Action: TBD

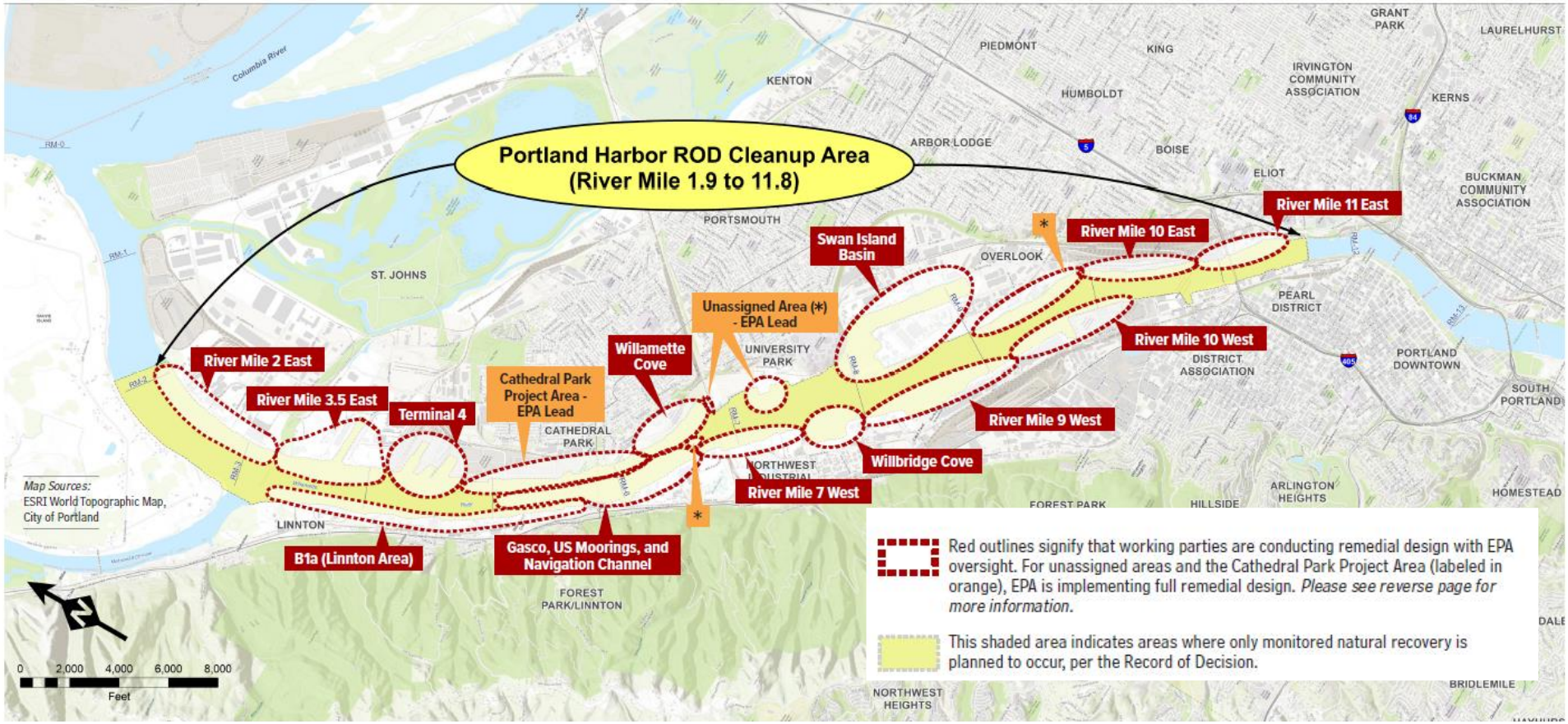


PORTLAND HARBOR SUPERFUND SITE UPDATES

JUNE 2024

OVERVIEW The in-river portion of the Portland Harbor Superfund Site spans about 10 miles of the Lower Willamette River in Portland, OR. EPA released a final cleanup plan (also called the Record of Decision or ROD) in January 2017 to address contamination in the sediment, surface water, and groundwater that poses an unacceptable risk to human health and the environment. All of the acres designated for active in-water remediation at the Site are now in remedial design. This document provides a general project update.

EPA United States Environmental Protection Agency



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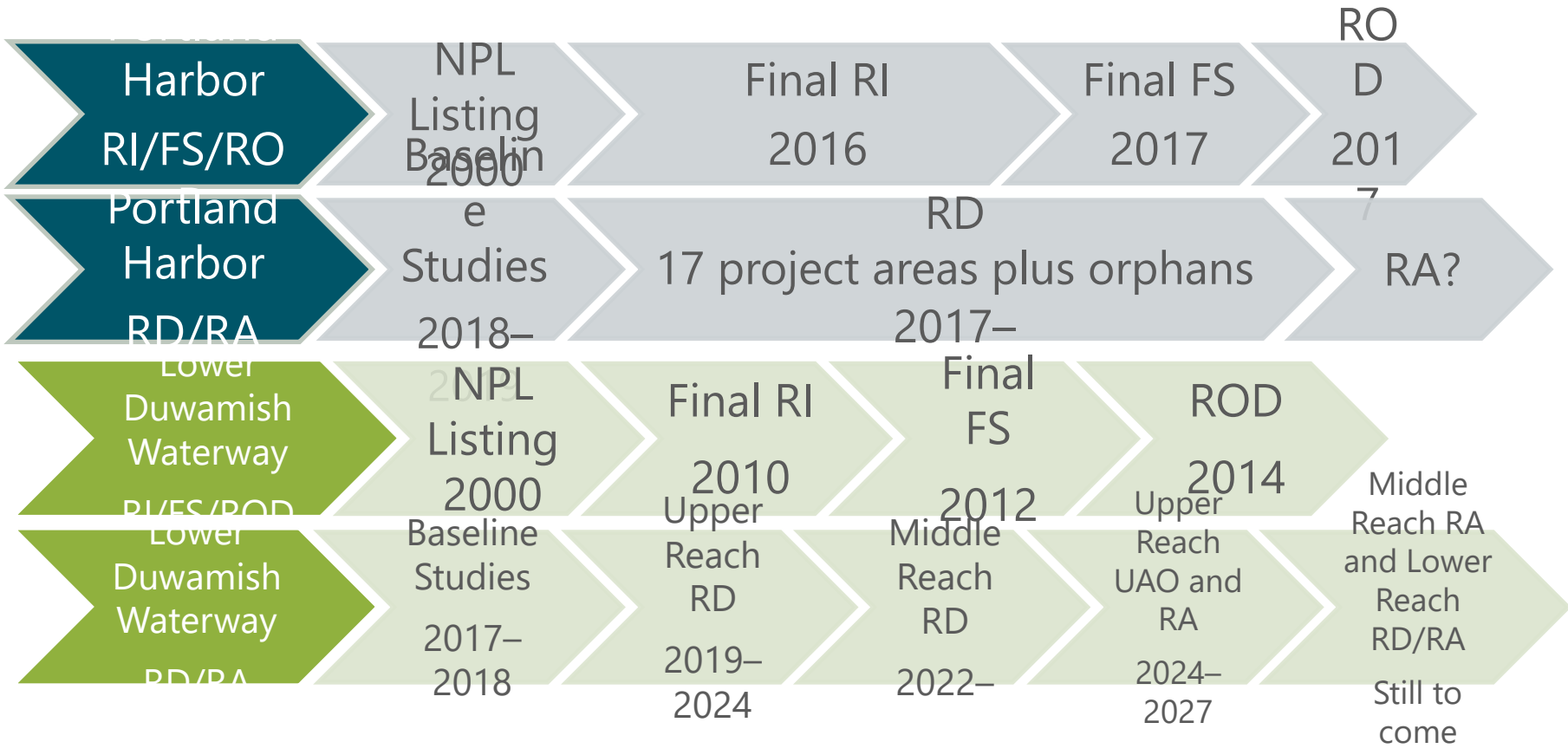
Timeline for Each Site



Upland Cleanup Process

- Portland Harbor
  - Oregon DEQ is the agency responsible for working with property owners to investigate and clean up upland properties
  - Source Control Sufficiency Assessment prepared for each project area as part of AOC for remedial design with EPA
- Lower Duwamish Waterway
  - Washington Department of Ecology (Ecology) is the agency responsible for working with property owners to investigate and clean up upland properties
  - Ecology works with upland owners to prepare Sufficiency Assessment and EPA issues Sufficiency determination

What questions do you have?

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Lessons Learned

- Effective pre-design investigations lead to better outcomes
- Adaptive management ensures flexibility during RA
- Contingent remedies avoid transaction costs
- Interim vs final settlements/orders
- Stakeholder engagement is critical for project success