EAGLE HARBOR WA

HELEN BOTTCHER, USEPA REGION 10

Wyckoff/Eagle Harbor Site Overview



Objectives of Remediation

- East Harbor COCs
 - PAHs and pentachlorophenol
- West Harbor COCs
 - PAHs and mercury
- Cleanup Goals
 - Protect benthic organisms and meet MTCA MCULs (CSLs) in surface sediment
 - Achieve the SQS (SCO) and reduce contaminant concentrations in fish and shellfish to levels protective of human health and the environment

Creosote

- Occurs primarily as NAPL
- Approximately 1 million gallons released during facility operations
- Approximately 650,000 gallons remain in site soils and groundwater
- Difficult to control and contain





Cleanup Decisions

- East Harbor 1994 ROD
 - Capping subtidal sediments
 - MNR in intertidal sediments
 - MNR expected to take 10 years following source control
 - 2007 Explanation of Significant Differences for West Beach
 - 2018 ROD Amendment for Intertidal Beaches
- West Harbor 1992 ROD, 1995 ROD Amendment
 - Dredging and disposal in on-site confined disposal facility
 - Low-impact capping and thin-placement over most areas with some thick (1-meter) caps

Summary of Remedy

- East Harbor
 - 1993/1994 Early Action: Capping of 54 acres with 2 to 6 feet of sand (navigational dredge material)
 - 2000: Capping of 15 acres with 1 to 3 feet of quarry sand
 - 2001: Capping of 1 acre with 2 to 25 feet of quarry sand
 - 2008: Exposure barrier (5 acres with 2 feet of sand, gravel over 1 foot of cobble)
 - 2017: Cap repair of 9 acres with 1 foot of sand and 4 acres of rock armor
- West Harbor
 - 1997: Dredging and capping of 7 acres (0.5 to 3 feet sand)
- East Harbor Source Control
 - 2000: Shoreline sheetpile wall installation

Eagle Harbor Capping Areas



Regulated Navigation Area

Federal law prohibits

 "anchoring, dredging, laying cable, dragging, seining, bottom fishing, conducting salvage operations, or any other activity which could potentially disturb the seabed"



Significant Remedy Scope or Schedule Deviations

- Careful (low production rate) cap placement required to ensure effective containment of underlying NAPL
 - High production split-hull barge placement mobilized NAPL into globules on cap surface requiring follow-on low production rate capping
- Beneficial reuse of clean navigation dredged material required extensive coordination with other state and federal agencies
- Source control complexities not originally envisioned
- Cleanup goal on intertidal beaches not met after 10 years of MNR

When Were External Sources Characterized and Addressed?

- External sources mostly upland
- Progressive source controls implemented from 1988 to present
 - Facility closure; product tanks, waste sludge and grossly contaminated soil removal; groundwater extraction; and sheetpile wall installation
 - Groundwater extraction continues (operated by WA State Dept. of Ecology)
- Upland source control not expected to be complete until approximately 2030

Primary Pre- and Post-Remedy Effectiveness Monitoring Elements

- Monitoring focused on PAHs
- Surface sediment (0 to 10 cm) PAH concentration changes
- English sole liver lesion monitoring (NOAA and WDFW)
 - NOAA linked liver lesions (cancer) and reproductive impacts to sediment PAH concentrations in laboratory experiments
 - Eagle Harbor previously exhibited the highest liver lesion prevalence on the West Coast



English Sole

Liver Lesion

Did the Remedy Achieve Short- and/or Long-Term Remediation Objectives for Surface Sediment?

- Capping between 1994 and 2001 achieved a five-fold reduction of the HPAH SWAC across Eagle Harbor
- Localized sediment recontamination in two areas
 - Addressed by 2008 exposure barrier system and 2017 cap repair
- Current surface sediment PAH levels now less than ROD cleanup standards



Is the Remedy on Track to Achieve Long-Term Remediation Objectives for Water and/or Biota?

- Hockey stick regression from NOAA laboratory experiments suggest decrease in PAHs should result in decrease in lesion prevalence
- Five-fold reduction of the HPAH SWAC resulted in a corresponding decrease in liver lesions



English Sole Liver Lesion Monitoring 1984 to 2011



Monitoring Tools

- Through-cap cores
- Passive porewater samplers
- Video probe survey
- TarGOST laser-induced fluorescence probes
- Shallow pit/elutriate surveys
- Clam tissue





Key Take-Home Message: Control Sources Early

- NAPL source control is complex—do not underestimate difficulties
- Intertidal beach remediation deferred until source control measures implemented
- Still have not achieved source control on beaches north and east of the Wyckoff facility
 - 2018 ROD Amendment: replace perimeter wall and dredge/cap beaches
 - 2019 ROD Amendment: in situ solidification/stabilization of soil and NAPL
- Adaptive management/learning by doing works
 - Balance fast-track early action opportunities with detailed design evaluations

Other Key Take-Home Messages

- Implement early actions where it makes sense
 - Capping pros: quick, relatively inexpensive to implement and very effective in controlling PAH exposure where not disturbed
 - Capping cons: requires regular monitoring and repair to remain effective and 5-year reviews very important
- Use simple and cost-effective monitoring tools where you can
 - Video probe
 - Rebar to measure thickness of the EBS layer
- Remember nature is resilient—if you build the right physical habitat, biology will do the rest (flatfish recovery, clams, and eelgrass)

Final Take-Home Message: It Takes a Village

- USEPA RPMs: Dave Tetta, Neil Thompson, Peter Rubenstein, Lori Cohen, Sally Thomas, Elly Hale, Ken Marcy, Joe Wallace, Hahn Shaw, Mary Jane Nearman, Howard Orlean, Helen Bottcher, Jacob Moersen
- Long-time partnership with USACE, Seattle District
- USEPA RAC contractors and many others
- WA State Dept. of Ecology and natural resource trustee agencies
- Bainbridge Island community