Portland Harbor CAG
Presentation by
The Lower Willamette Group

Draft Remedial Investigation Report
November 11, 2009

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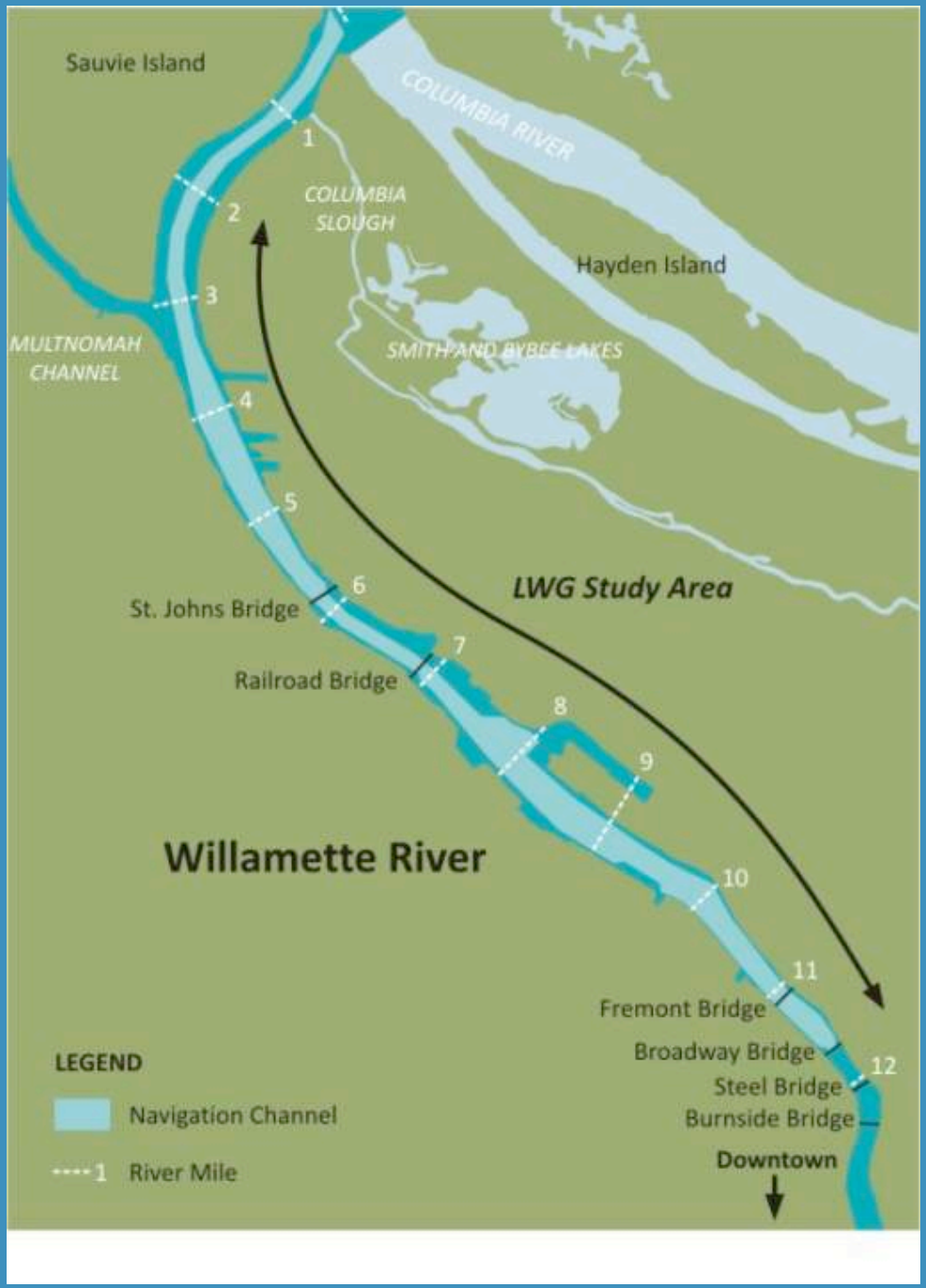
Portland Harbor Superfund Site

Study Area between Sauvie Island (RM1.9) and the Broadway Bridge (RM 11.8)



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Draft Remedial Investigation Report

- Represents cooperative approach with agencies, Tribes and community
- 8 years of sampling – hundreds of thousands of data points
- $75 million investigative and oversight costs
- Adequate to move forward with FS

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Superfund is one of many Willamette River Programs

- Portland Harbor Superfund Site (CERCLA, RCRA, OPA)
- Oregon Water Quality Management (TMDLS) - Oregon DEQ
- Superfund Health Investigation & Education - Oregon Division of Human Services
- Dredge Maintenance Management Plan - US Corps of Engineers
- Willamette Basin Water Quality Management - US Geological Survey
- Office of Healthy Working Rivers - City of Portland
- North Reach Plan – City of Portland
- "Big Pipe" Combined Sewer Overflow Programs - City of Portland
- Willamette River Watershed Planning - City of Portland
- Willamette Water River Trail - Willamette Riverkeeper
- Willamette Restoration Initiative - Willamette Conservation Network
- Columbia Slough Action Plan - Columbia Slough Watershed Council

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Briefly….

- Character and use of river has changed a lot with 150 years of use
- Contamination found mainly in near shore sediments – concentrations generally higher in buried sediments
- Contamination from multiple sources – historic and current
- Four main chemicals with potential risk to Human and Ecological Health, PCBs driving most potential risks
- Resident fish ingestion poses most potential human health risk – water and sediment contact less potential risk

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Presentation Agenda

- Data Set
- Physical System
- Sources
- Chemical System
- Biological System - Risk Assessments
  - Human Health
  - Ecological
- Feasibility Study Process & Next Steps

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RI Data Collected

Data Collected for the Portland Harbor Remedial Investigation

NUMBER	COLLECTED SAMPLE TYPES AND INVESTIGATIONS
1,949	Surface sediment and beach composite samples
2,168	Subsurface samples from 860 core locations
460	Composite tissue samples
282	Surface sediment samples tested for toxicity to aquatic invertebrates
186	Surface water samples from 25 point and transect stations
420	Transition zone water samples from 9 sites
52	In-river sediment trap samples from 16 locations
501	Stormwater outfall composite water samples
44	Stormwater outfall sediment trap samples
281	Catch basin and in-line solids samples
6	Groundwater seep samples
500	Sediment profile images
800	Sediment trend analysis sample points
5	Major bathymetry surveys of 16 miles of the LWR
1	Time-series sediment stake nearshore bank elevation change measurements
3	Acoustic doppler current profiler surveys
1	Hydrodynamic and sediment transport model data collection effort
	In addition, the LWG conducted three wildlife habitat surveys and a cultural resource survey.

Note: Table includes data collected by LWG and other relevant studies.

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Samples types and use

Data Collection	Nature & Extent	Human Health Risk Assessment	Ecological Risk Assessment	Feasibility Study	Cultural Resources
Sediment Trend Analysis	X	X	X	X	
Sediment Profile Imaging	X		X	X	
Multibeam Bathymetry	X	X	X	X	
Hydrodynamic Modeling	X	X	X	X	
Sediment Stakes	X	X	X	X	
River Velocity	X	X	X	X	
Bank Conditions	X	X	X	X	X
Multiplates	X		X		
Amphibian Survey			X		
Fish Tissue	X	X	X		
Clam & Crayfish	X	X	X		
Bioassays	X		X		
Surface Sediment	X	X	X	X	X
Subsurface Sediment	X	X	X	X	X
Beach Sediment	X	X	X	X	X
Surface Water	X	X	X	X	
Transition Zone Water	X	X	X	X	
Seeps	X	X		X	
Sediment Traps	X	X	X	X	
Stormwater	X	X	X	X	
Sidescan Sonar		X	X	X	
Geotechnical Data	X	X	X	X	

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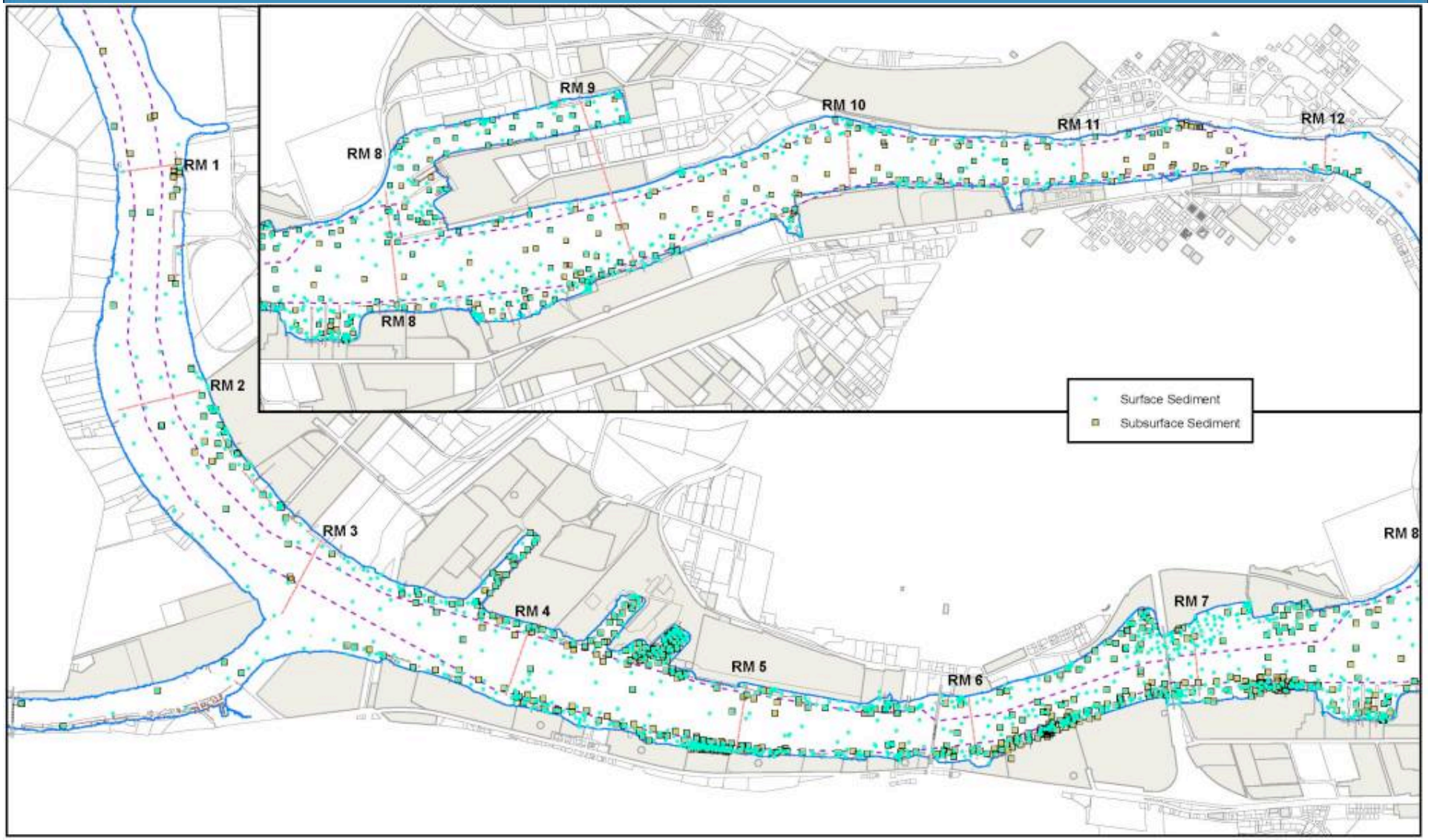
Sediment Sample Locations



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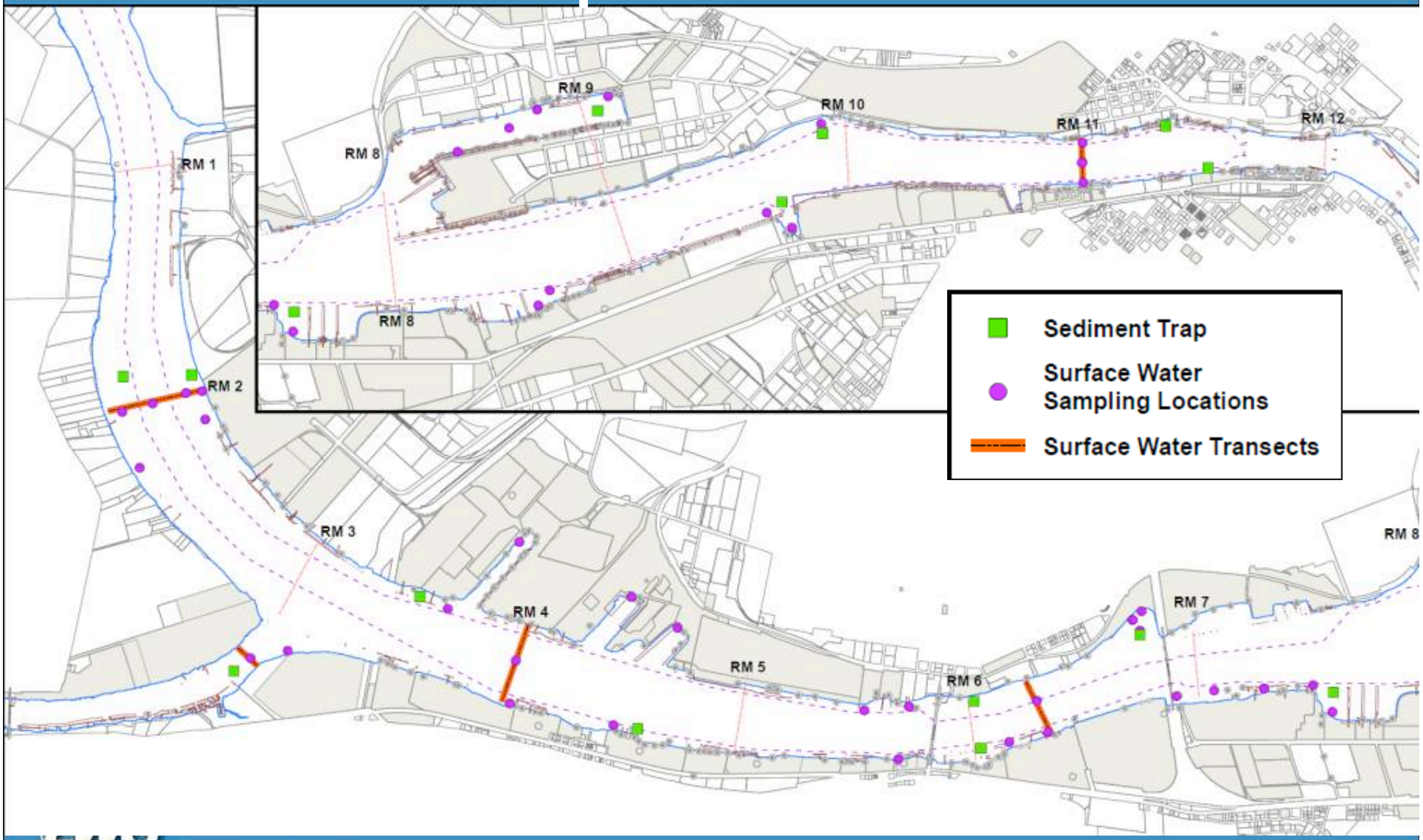
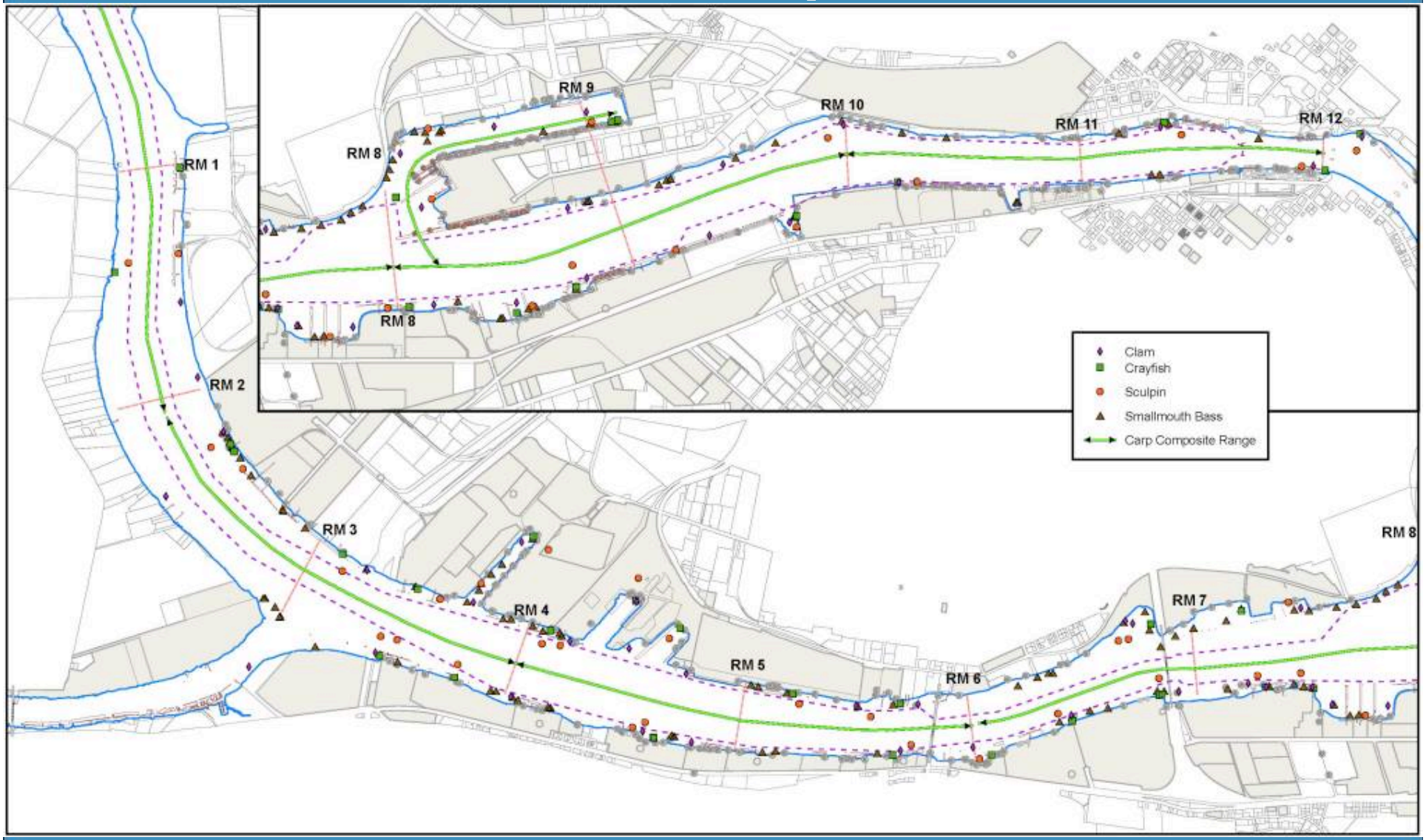
Sediment Trap & Surface Water Sample Locations



Selected Biota Sample Locations



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Physical System

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Physical System Summary

- Study Area is a wide, low-energy reach of the LWG
- Highly altered by channel construction, channel diversions, nearshore fills, and in-water structures
- Navigation channel extends nearly bank-to-bank in some areas, channel slope is steep, and shallow nearshore areas are limited
- Most nearshore/off-channel areas are relatively stable depositional settings.
- The channel is also depositional with the exception of RM 5 to 7 (near the center of the site) and the area upstream of RM 10
- RI modeling suggests limited potential for large-scale erosion during a flood event

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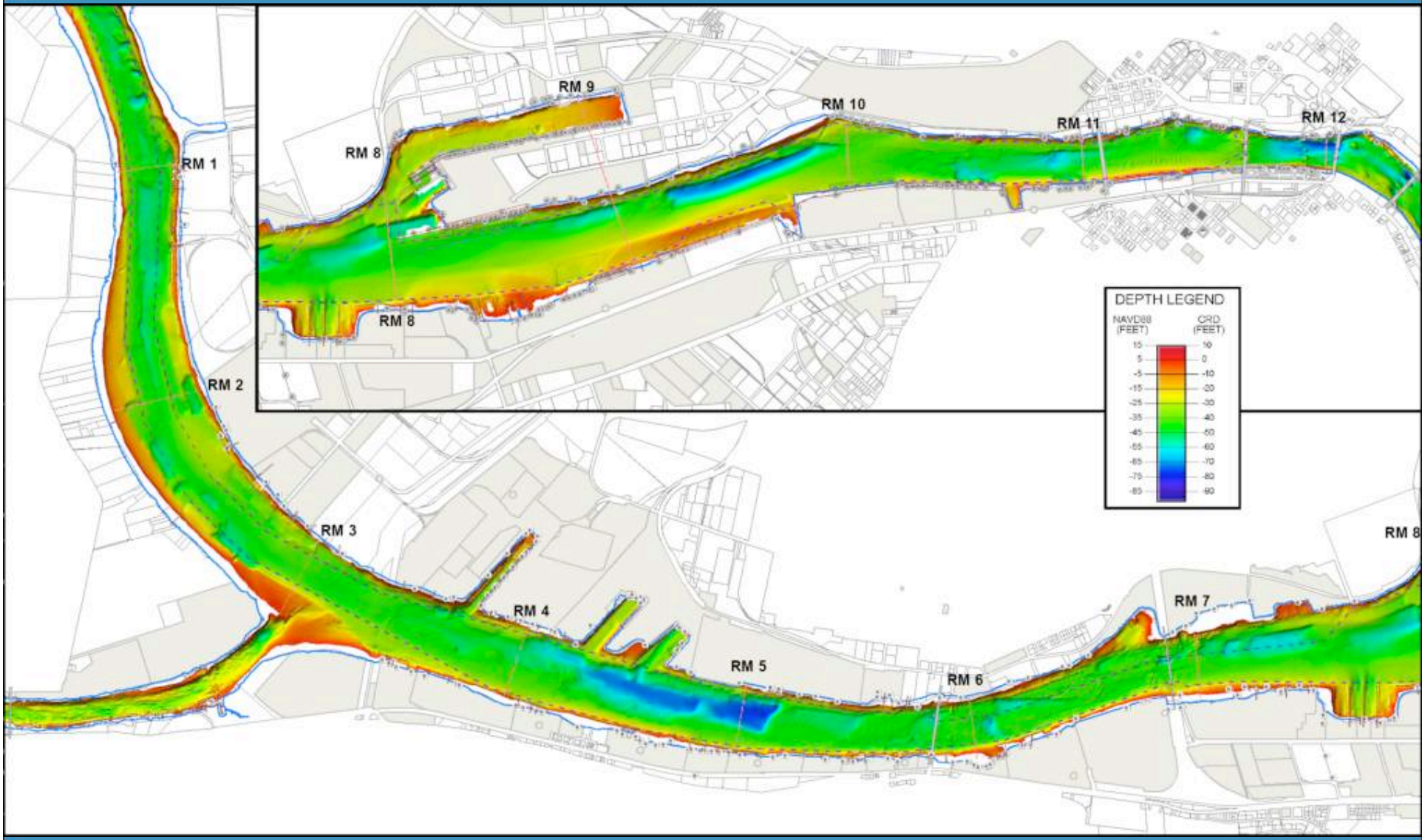
Bathymetry



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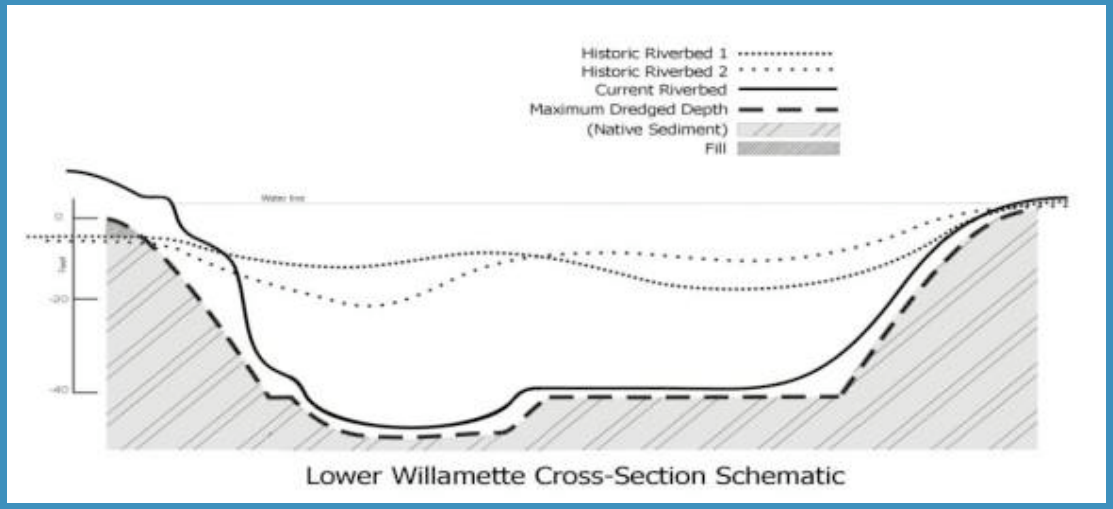
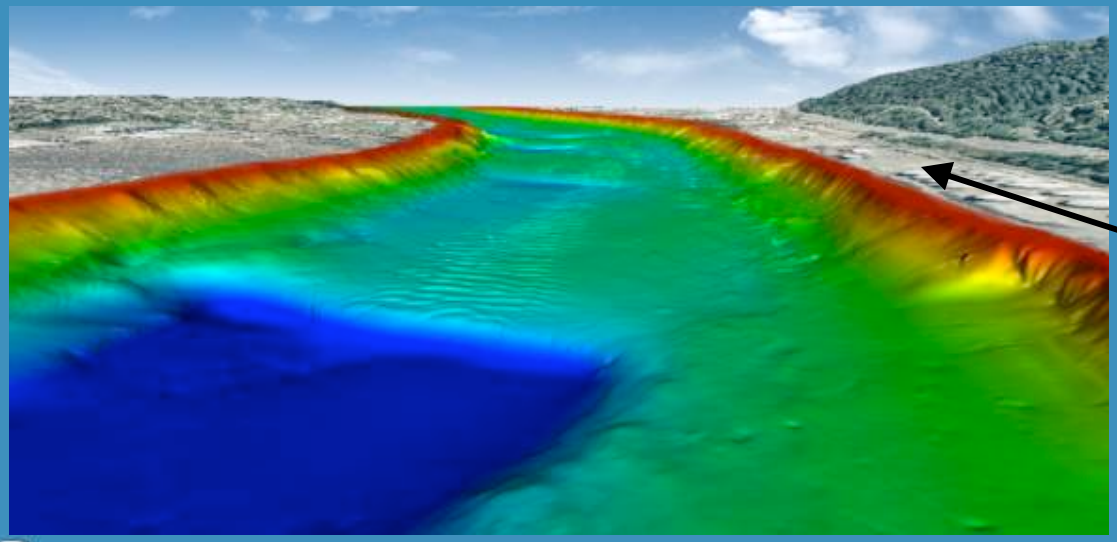
Physically Altered Riverbed



Lower Willamette Cross-Section Schematic

- Diverted
- Channelized
- Filled
- Bank Treatments
- Structures



Looking upstream from RM 5

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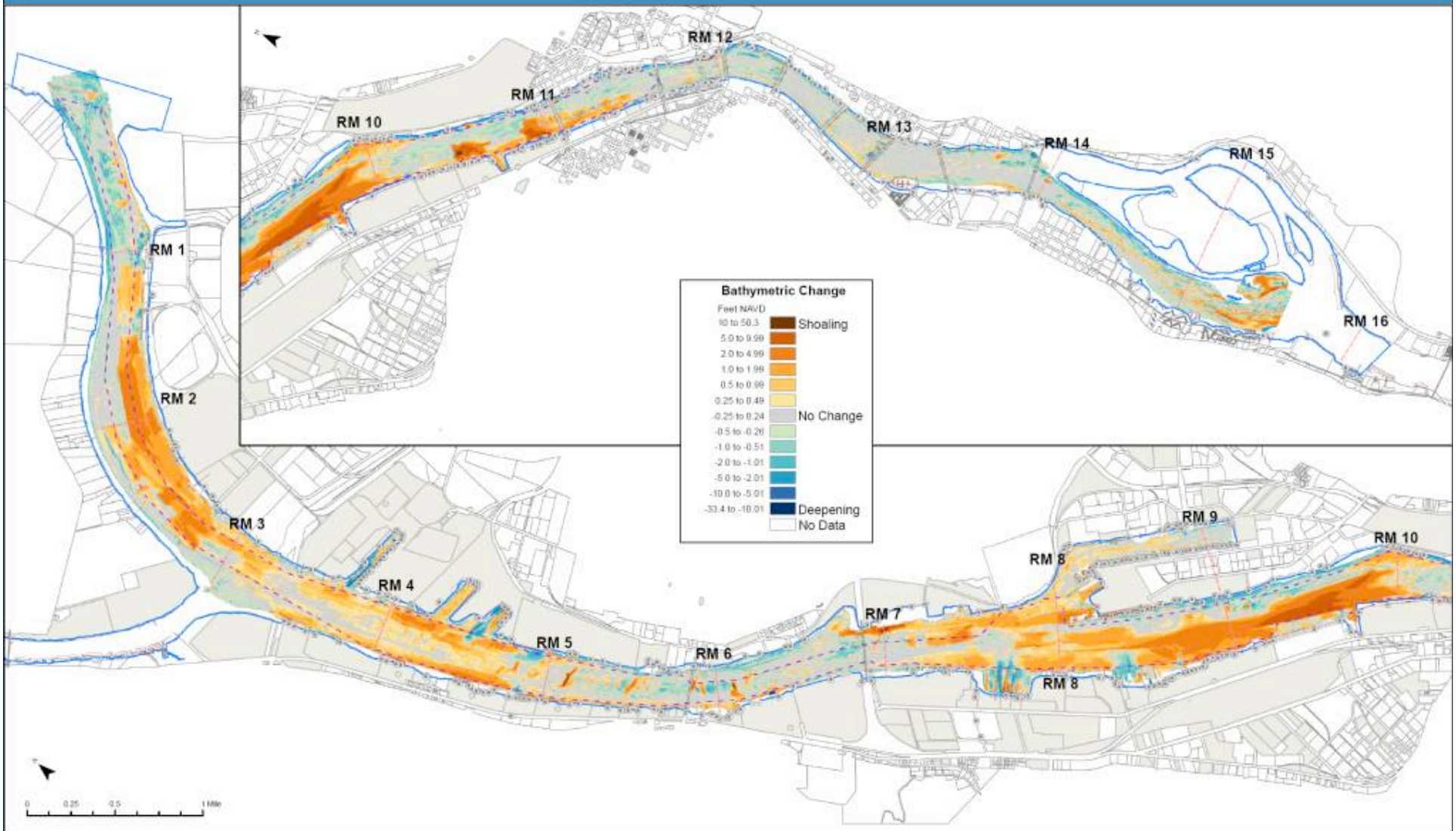
Bathymetric Change 2002-2009



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Sources of Contamination

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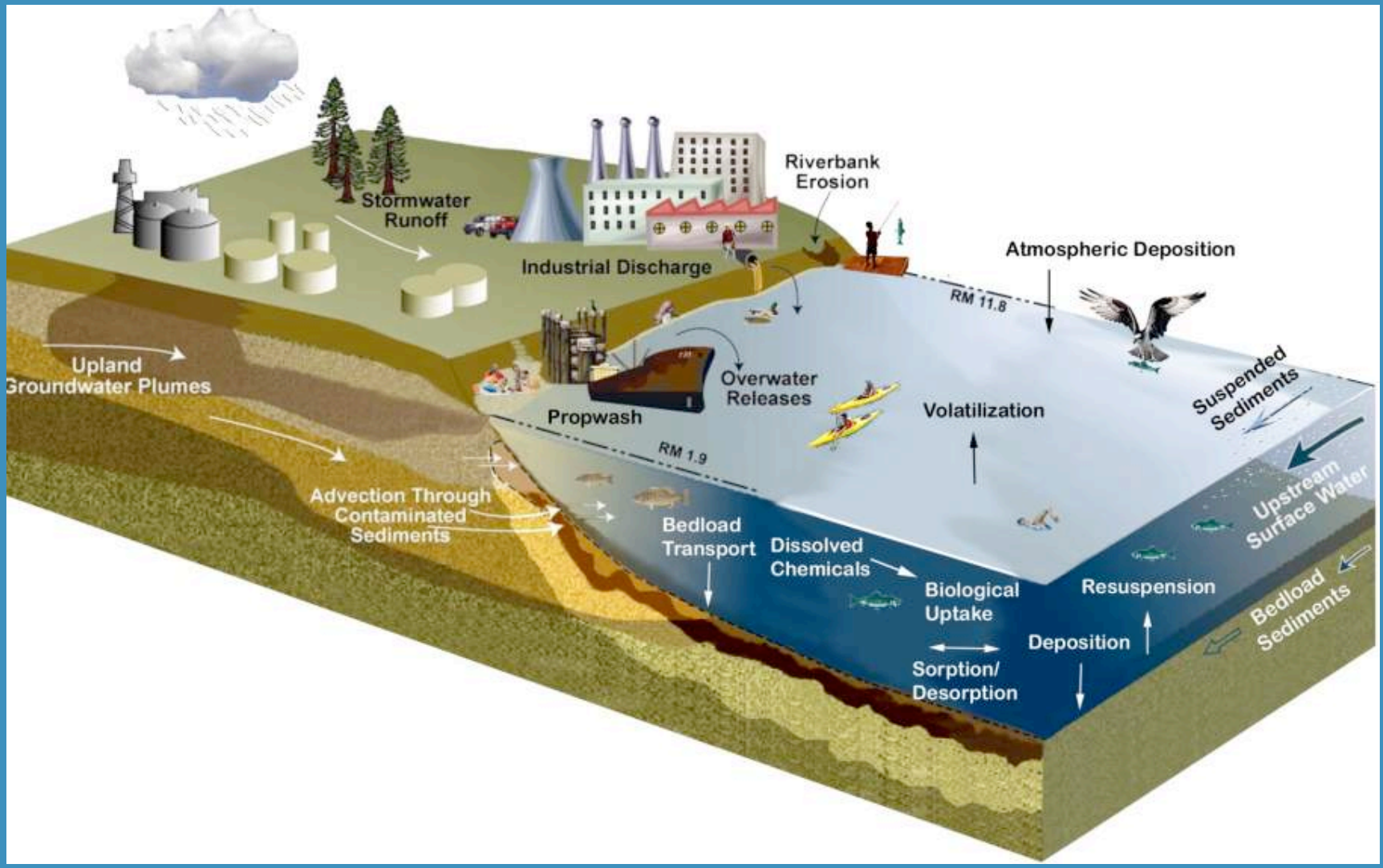

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Sources

Chemicals released to Study Area have been significantly reduced over time due to:

- cessation of operations,
- improved management practices,
- source control activities

e.g. couldn't recreate current conditions at this site with today's chemical loading.

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Chemical System (Sediments)

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Sediment Chemistry Summary

- Highest concentrations of chemicals in sediments in localized nearshore and off-channel areas
- Chemical concentrations are generally higher in buried sediments than surface sediments – inputs greater in past and surface sediment quality has improved
- Surface sediment chemical concentrations in channel and away from sources comparable to levels in upriver sediments, i.e., upstream of Ross Island
- Some downstream migration of some chemicals but most areas of high concentrations stable over time.
- Sediments immediately downstream show little evidence of chemical migration from the Study Area

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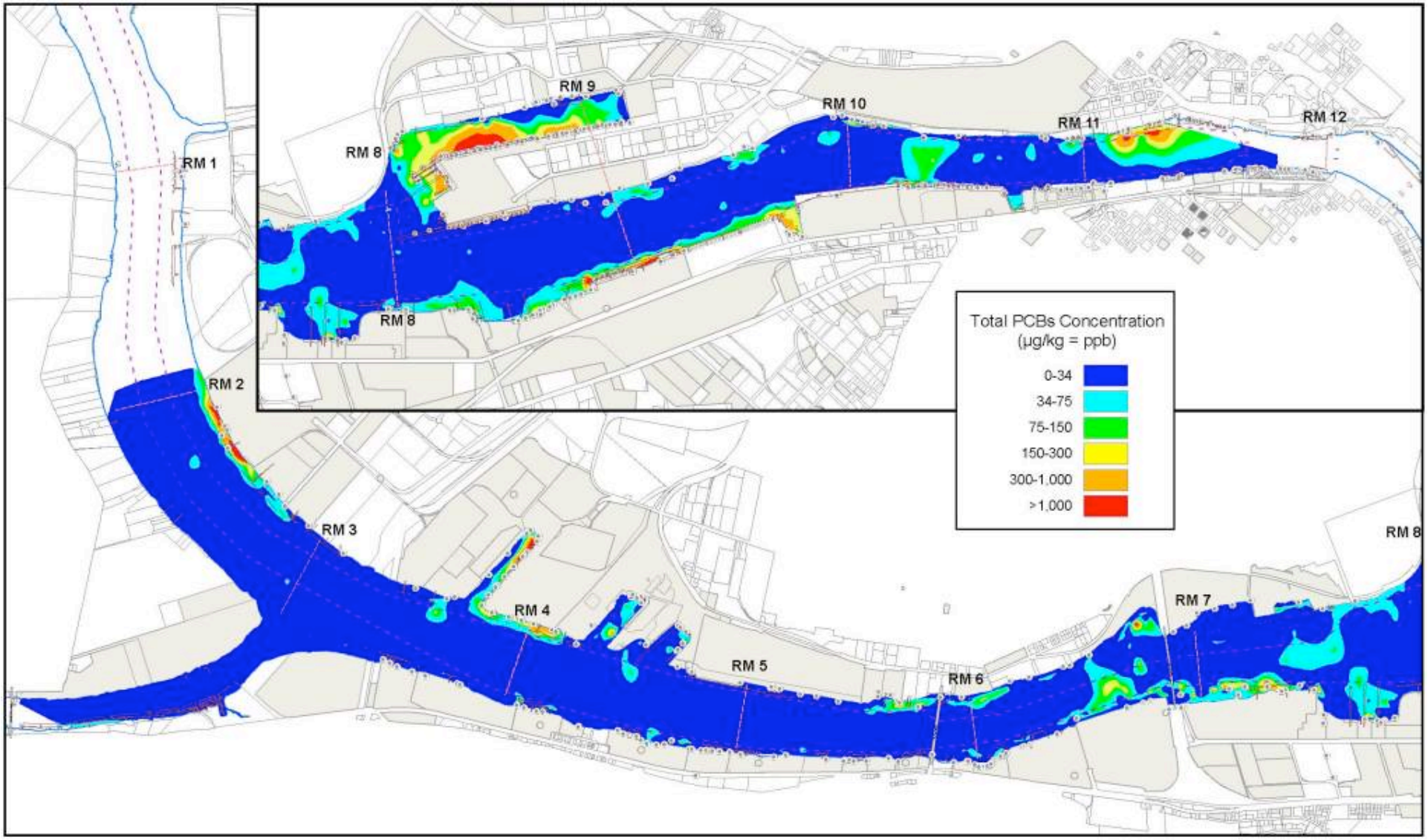
PCBs



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Biological System (Risk Assessments)

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Baseline Human Health Risk Assessment (BHHRA)

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BHHRA Objectives

- Follow approach in Programmatic Work Plan and U.S. EPA and DEQ guidance
- Incorporate additional U.S. EPA requirements and directives
- Determine whether exposure to chemicals in sediment, water, or biota (fish, clams, etc) at the Study Area results in unacceptable risks to human health
- Provide a health-protective approach

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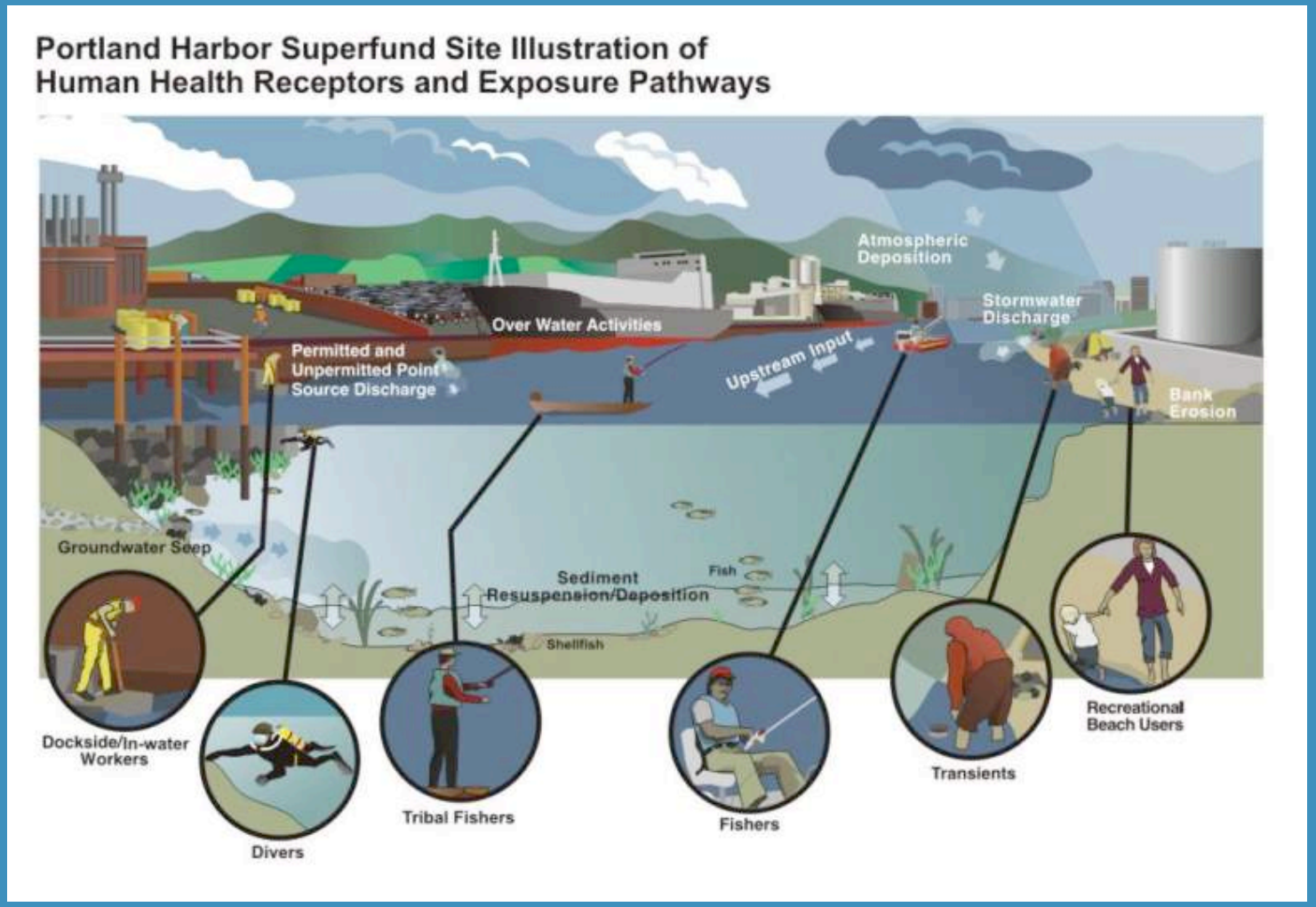
Human Health Exposure Pathways



Exposure Scenarios for Evaluation

	Beach Sediment: Ingestion and dermal absorption	In-water Sediment: Ingestion and dermal absorption	Surface Water: Ingestion and dermal absorption	Groundwater Seeps Ingestion and dermal absorption	Fish/ Shellfish: Ingestion
Workers	●	●			
Transients	●		●	●	
Beach Users	●		●		
Fishers	●	●			●
Diver		●	●		

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Two Examples of Receptor Exposure Assumptions

	Fisher		Beach User	
	Fish	Sediment	Sediment	Water
Intake Rate	19 meals per month 10 meals per month 2 meals per month	Face, hands, forearms and lower legs (beach) Hands and forearms (in-water) Soil ingestion rates	Face, hands forearms and lower legs (beach) Soil ingestion rates	Entire body Approx. 2 ounces per hour ingested
Exposure Duration and Frequency	365 days per year 30 years	2 or 3 days per week 30 years	5 days per week in summer, 1 day per week in spring/fall, 1 day per month in winter 30 years (adult) 6 years (child)	2 days per week in summer (adult) 5 days per week in summer (child) 30 years (adult) 6 years (child)
Uncertainties	Preparation methods Maximum concentration Species Consumed Site use Toxicity values	Beach use Site use Amount of contact Sediment adherence Toxicity values	Beach use Site use Amount of contact Sediment adherence Toxicity values	Swimming frequency Dermal absorption Toxicity values

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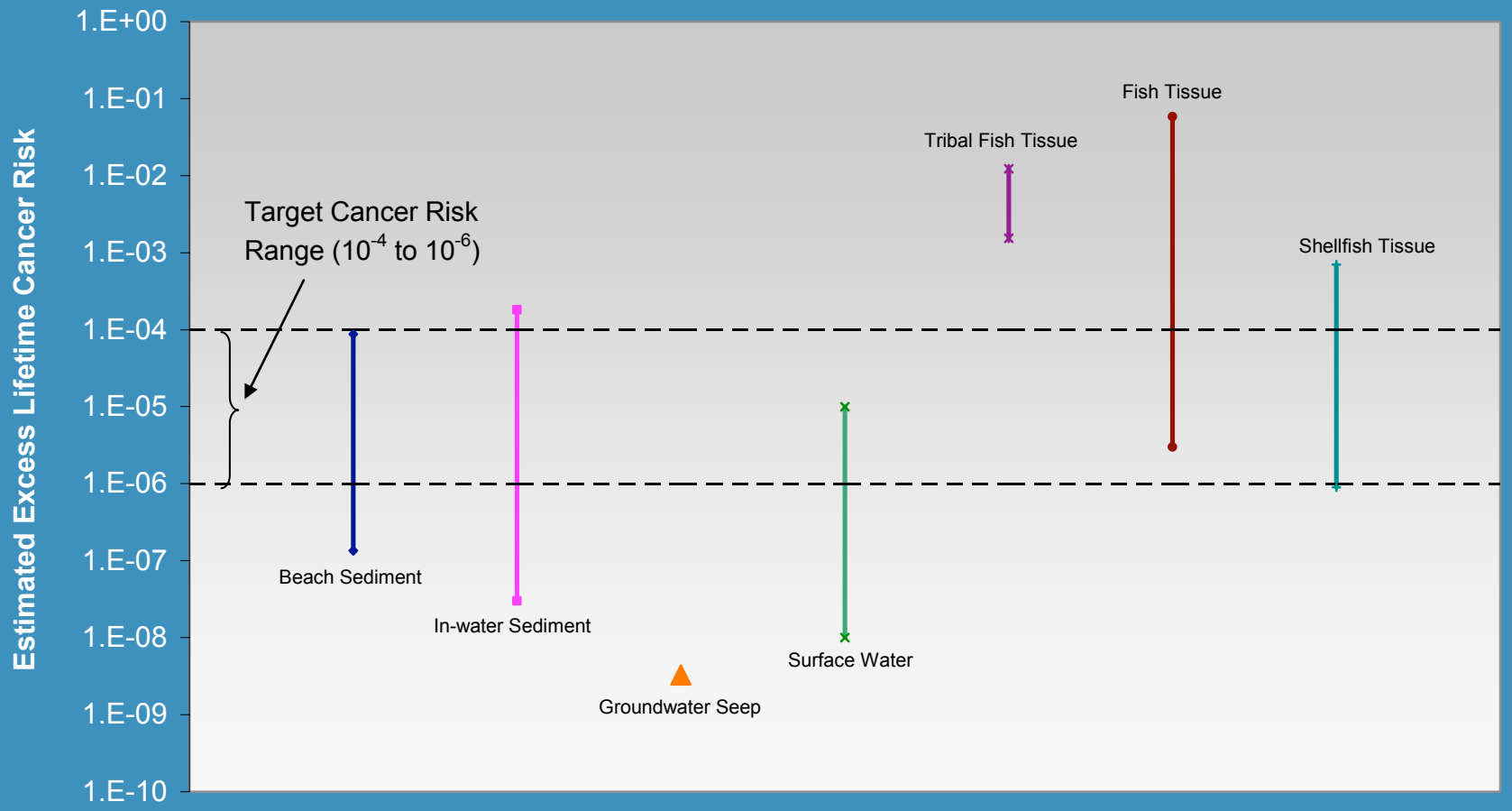
Risks for Exposure Scenarios



Ranges for 95% UCL or Maximum Exposure Cumulative Cancer Risk

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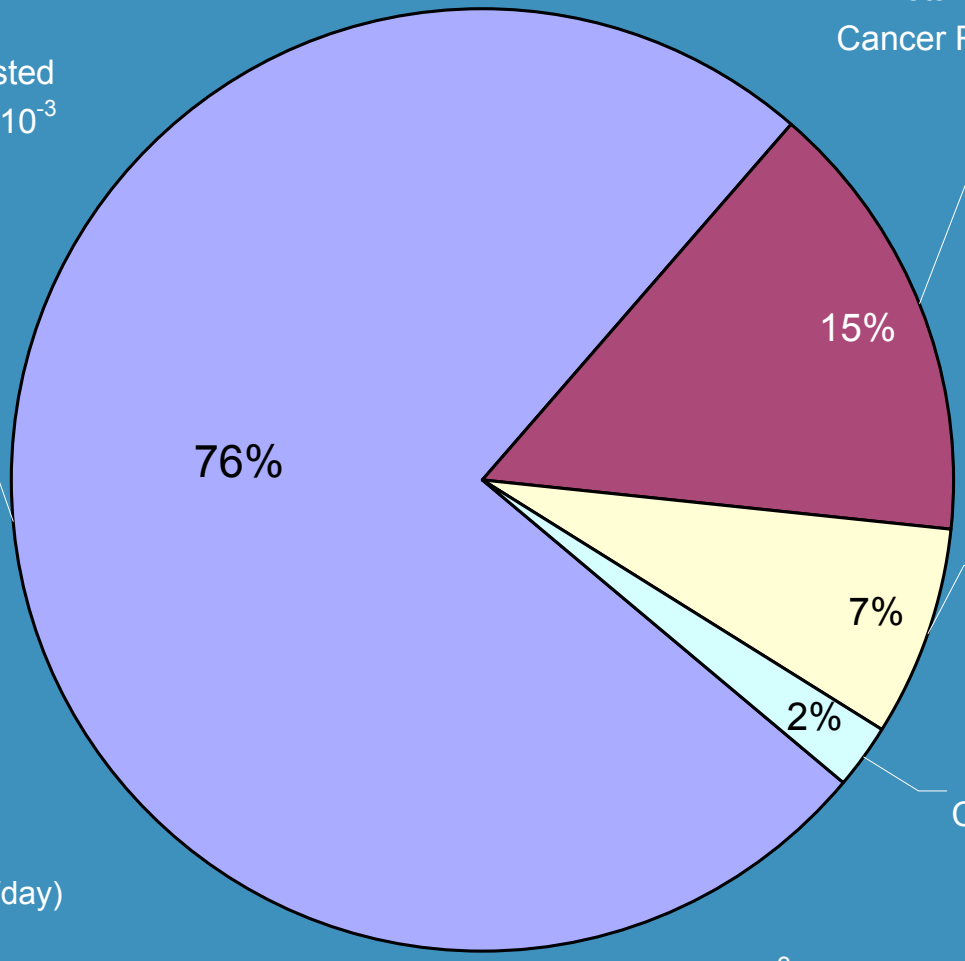
Chemicals Driving Human Health Risks



Cumulative Cancer Risk = 8×10^{-3}

Exposure Scenario:
Adult Fisher,
Whole Body Tissue Consumption,
Multi-species Diet,
Highest Consumption Rate (175 g/day)
Study-Area Wide
95% UCL/Max Scenario

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Baseline Ecological Risk Assessment (BERA)

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BERA Objectives

- Determine if ecological risks from uncontrolled releases of hazardous substances may be occurring in the Study Area under current conditions.

- Provide information to support decisions on how to protect ecological receptors.

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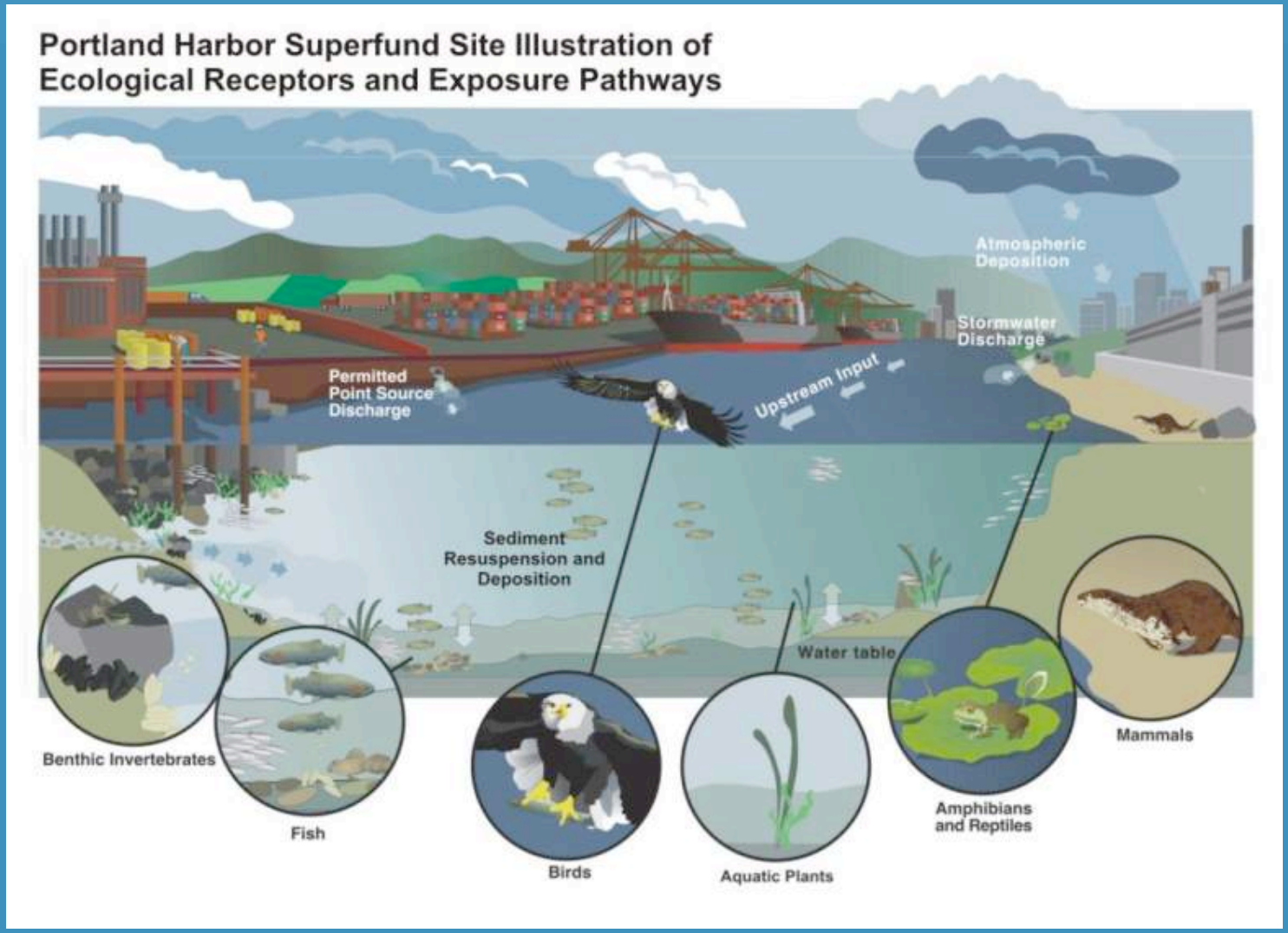
Ecological Exposure Pathways



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Ecological Receptors

- Aquatic Plant Community
- Benthic Invertebrate Community
- Fish – Sculpin, Peamouth, Juvenile Chinook Salmon, Largescale Sucker, Carp, Pre-Breeding White Sturgeon, Smallmouth Bass, Northern Pikeminnow, Pacific Lamprey Ammocoetes
- Amphibians/Reptiles – e.g., Northern Red-Legged Frog
- Birds – Osprey, Bald Eagle, Hooded Merganser, Spotted Sandpiper, Belted Kingfisher
- Mammals – Mink, River Otter

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Ecological Risk Assessment Approach

- Evaluate risks to ecological populations and communities, not individual organisms
- Use direct information about risks, e.g.
  - toxicity tests
  - physical examinations
  - tissue samples from exposed organisms
- Requires understanding how ecological receptors use habitat in (and outside) the Study Area

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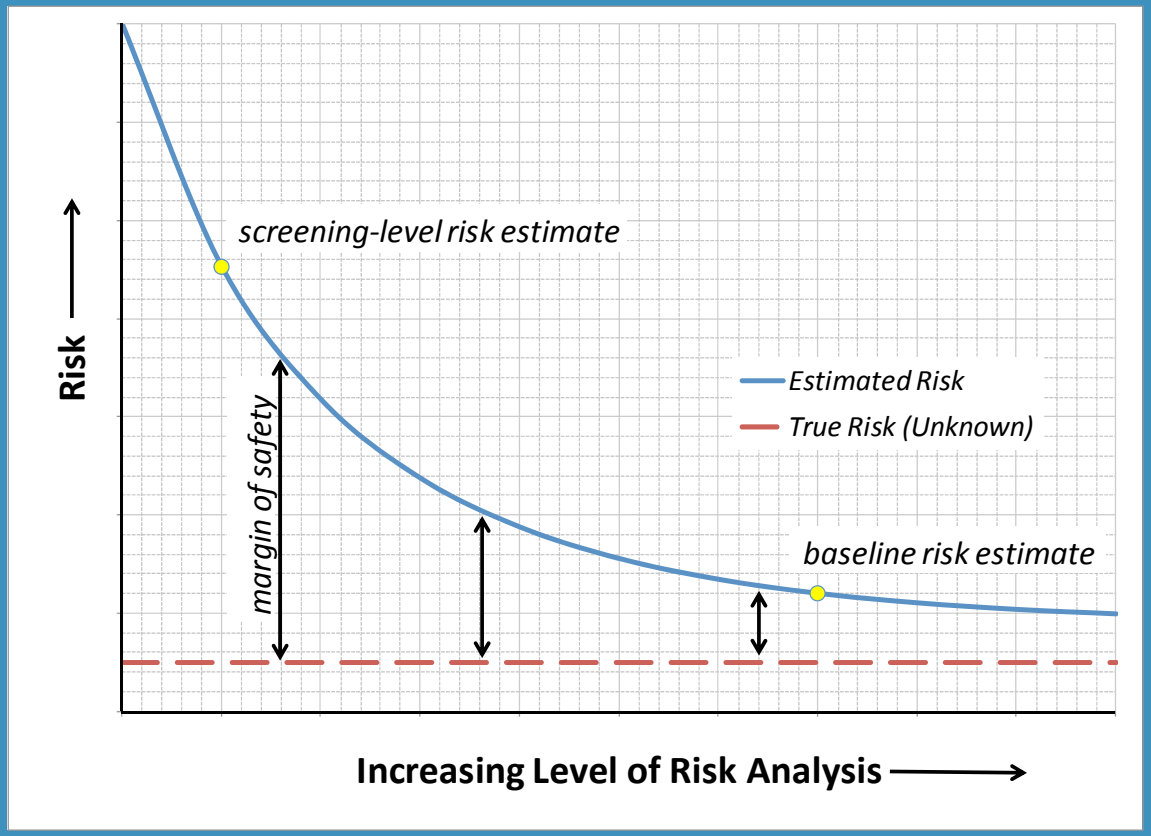
Risk Assessment Process



- Risk assessments use conservative assumptions.
- Baseline Ecological Risk Assessments are less conservative and produce better risk estimates than Screening Level Ecological Risk Assessments
- But BERAs still use conservative assumptions.

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Does the Ecological Risk Assessment Look at Scenarios in the Same Way as the Human Health Risk Assessment?

- The human health risk assessment looks at the way people use the Study Area, e.g., what exposure and risk if they eat fish from the Study Area every day, or if they are underwater divers.
- The ecological risk assessment looks at the way other species use the Study Area, examining those that use the Study Area the most, in order to be protective of others
- Some important factors in how the selected species use the Study Area are –
  - whether they are migratory, or relatively immobile
  - critical life stages that might depend on the Study Area's habitat (e.g., for rearing versus for spawning), and
  - whether they get all their food from the Study Area, or forage upland, or forage across an even wider area.

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Assessing Potential Risks to Fish and Wildlife

- Measure chemical concentrations to which organisms are exposed
- Use models to predict risks to avoid disrupting a nest or capturing an animal
- Compare exposure concentrations to the lowest concentrations that have been shown in a laboratory to affect organisms' survival, growth or reproduction.
- For threatened, endangered or other culturally significant species compare the exposure concentrations to concentrations that have been shown to have no effects.

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Assessing Potential Risks to the Benthic Community

- Measure chemicals in many hundreds of sediment samples from the Study Area and from reference area (upstream of Ross Island, downstream of Willamette Falls).
- Compare chemical exposure levels to toxicity values that other scientists have measured in laboratories.
- Conduct bioassays (toxicity tests) on benthic organisms exposed to the sediment to measure effects on growth and survival.
- Bioassay results indicate whether growth or survival of the tested benthic organisms in study area sediment was significantly different than for reference area sediment.
- Taken together sediment chemistry and bioassay results may identify which chemicals and concentrations were related to observed toxicity.

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Key Findings of the BERA

1. Unacceptable ecological risks are primarily from PCBs, dioxins/furans, DDT compounds and PAHs.

2. Mink, otter eco receptors at greatest risk. Most other risks co-located with PCB risks.

3. Risks for other chemicals likely reduced with remedies in areas of elevated PCBs.

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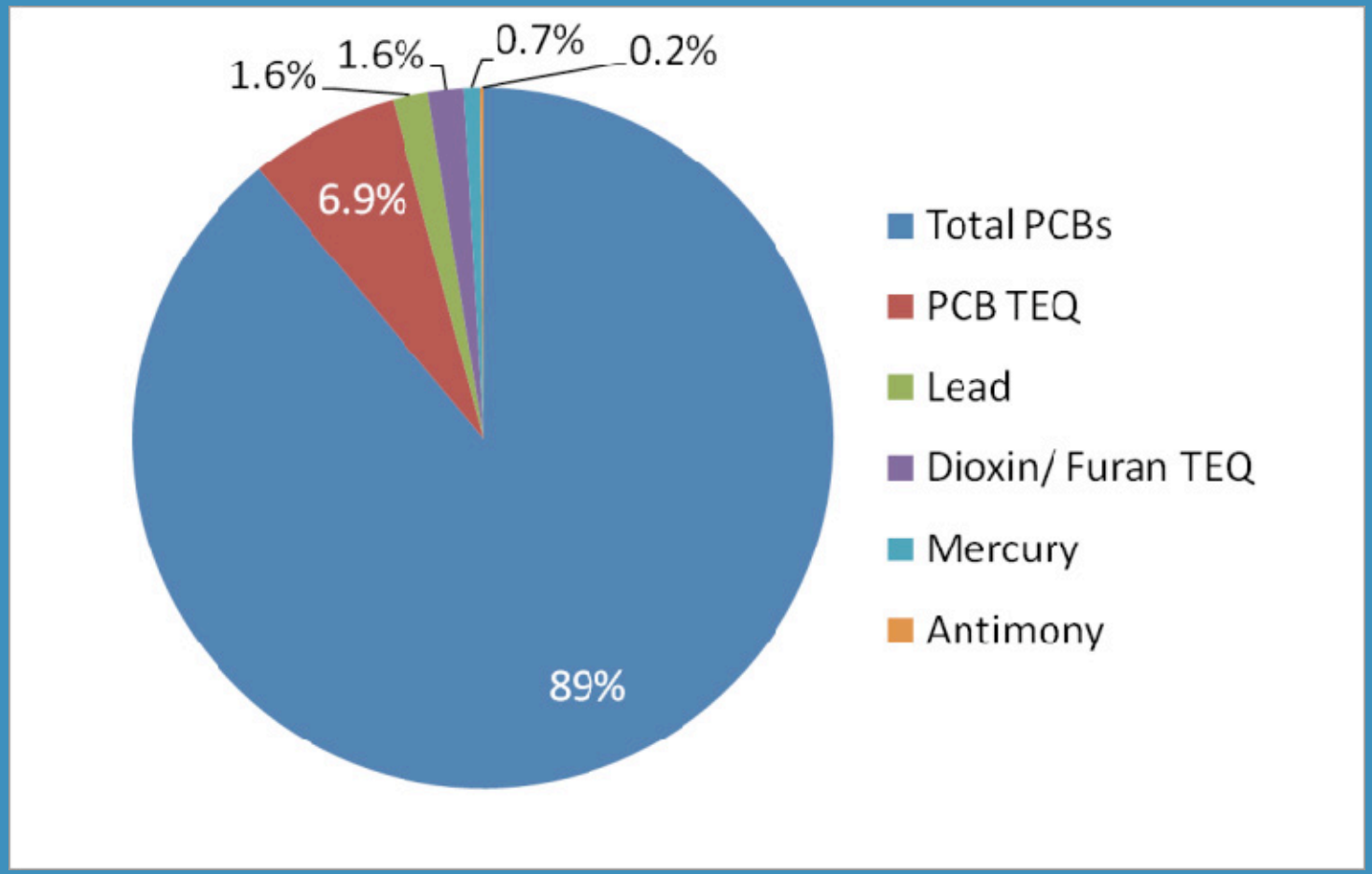
Chemicals Driving Mink Risks



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Key Findings of the BERA – Cont'd

4. Unacceptable ecological risks are primarily from PCBs, dioxins/furans, DDT compounds and PAHs.
5. Areas of risk were identified for the benthic invertebrate community, primarily in places along the west side of the river between river miles 5 and 8.
6. Mercury might pose some risk to bald eagles, but this is a Willamette Basin issue, not a Portland Harbor issue.

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Next Steps

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Development of Feasibility Study

- Early Preliminary Remedial Goals (PRGs) developed before risk assessments completed to start FS process and identify areas of potential concern

- FS ties potential risks from ingesting contaminants in fish to defining areas of sediment that may need cleanup

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Feasibility Study (continued)

- Early PRGs and Areas of Potential Concern will be refined following EPA review of draft human health and ecological risk assessments
- FS will evaluate cleanup options for each AOPC
- LWG will present overview of FS at February 2010 CAG Meeting

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Reducing Risk vs. Eliminating Risk

- Sediment cleanup can reduce the level of risk but can't eliminate risk
- Other agencies/programs that can reduce risks:
  - Oregon Health Assessment Program (fish advisories)
  - Water quality programs
  - Air quality programs
  - Source control programs

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How Cleanup Goals are Achieved

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Conclusion

- EPA Reviewing RI – comments expected in Q1 2010
- FS work underway
- FS expected to be completed end of 2010

www.epa.gov/region10/portlandharbor

Site Repository
St. John's Library
7510 N Charleston Ave
Portland, OR 97203
(503) 988-5397

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