

EPA Public Forum - Presentation

Proposed Explanation of Significant Differences (ESD)
Portland Harbor Superfund Site



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December 12, 2018

- **Site background**
- **Why is there a proposed ESD (Explanation of Significant Differences)?
What is a proposed ESD?**
- **What does this change mean for the Portland Harbor Superfund Site?**
- **Top 10 Proposed ESD Questions**

Site Background

These Focused COCs are:

- The most widespread
- Have the most associated risk
- Address other COCs

- **Focused Contaminants of Concern**

- **Polychlorinated Biphenyl (PCBs)**

- ☆ **Where Do They Come From?** Used in electrical equipment, oil, plastics

- **Polycyclic Aromatic Hydrocarbons (PAHs)**

- ☆ **Where Do They Come From?** Produced when coal, oil, and gas are burned, spilled, etc....

- ☆ **Benzo(a)pyrene (BaP) is a PAH.** BaP cancer risk is used to assess cancer risk for other carcinogenic PAHs

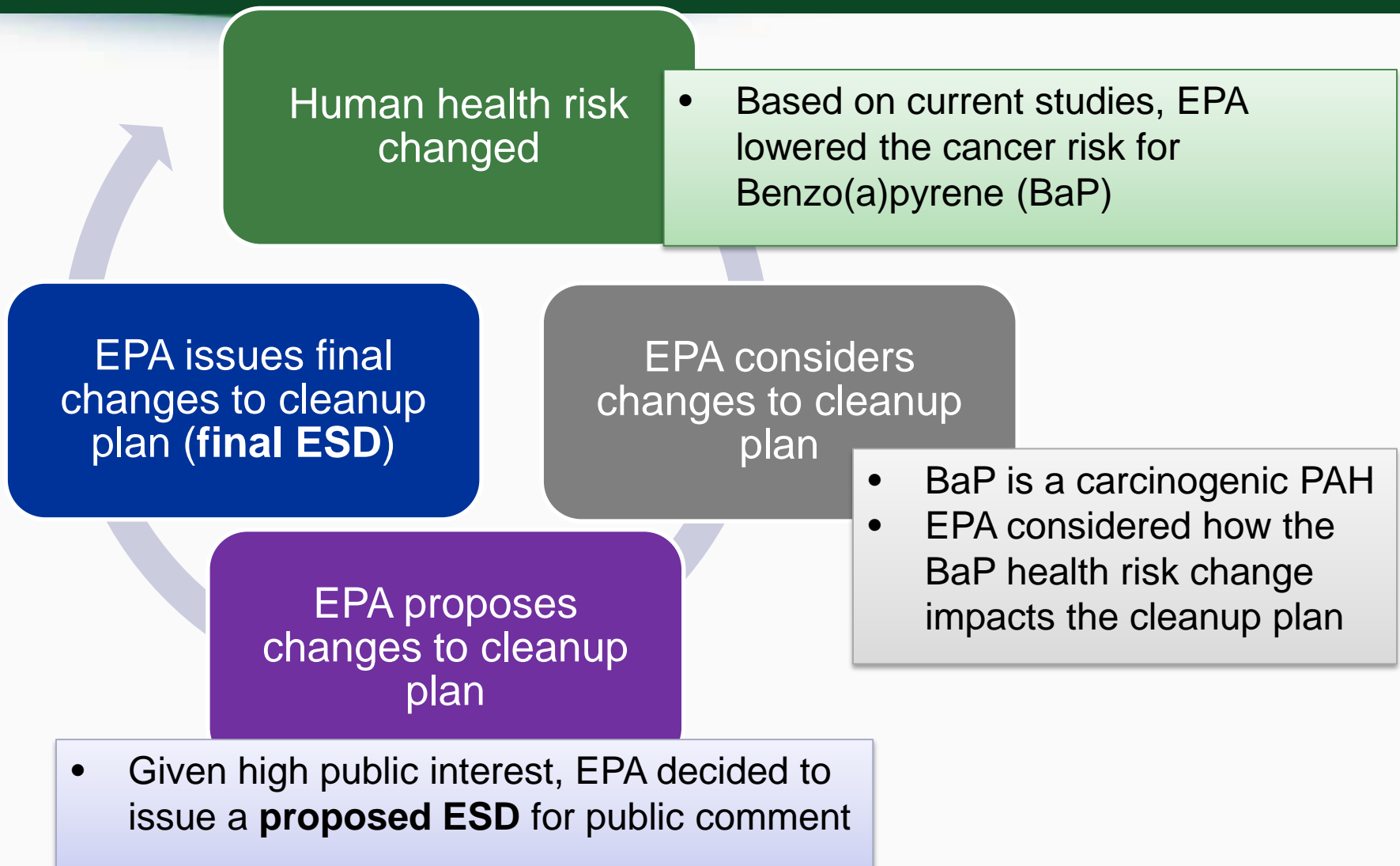
- **DDx (DDT, DDE, DDD)**

- ☆ **Where Do They Come From?** Commonly used in pesticides

- **Dioxins/Furans**

- ☆ **Where Do They Come From?** Created when certain products are made, like herbicides, pulp/paper, or when products are burned.

Proposed ESD (Explanation of Significant Differences?): What is it and why?



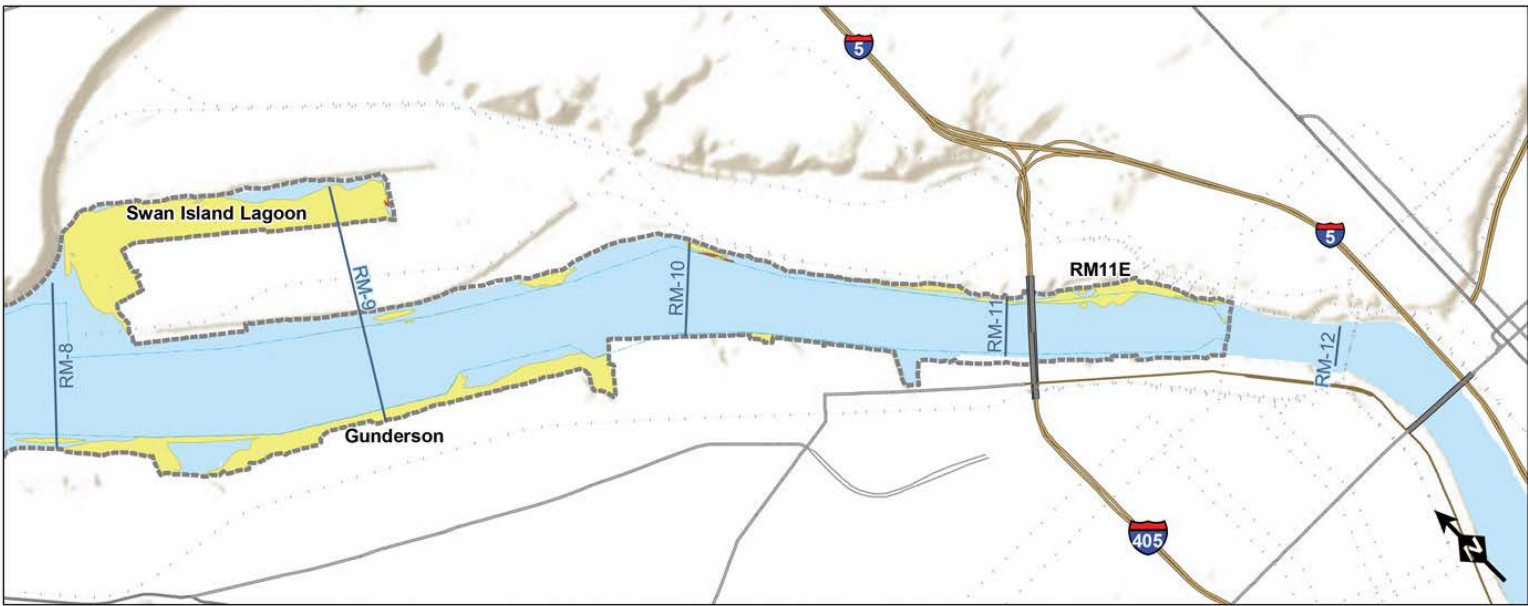
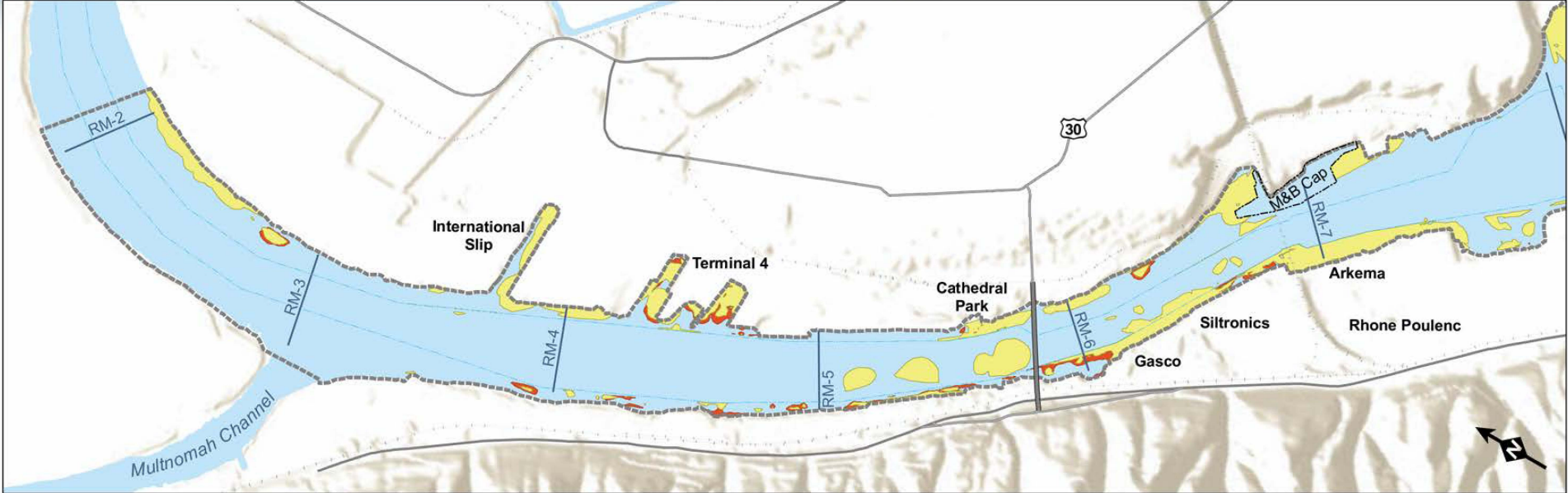
What does this mean for the Portland Harbor Superfund Site?



“BIG PICTURE”

	Total Remedial Area (Acres)	Cubic Yards (CY) Dredging & Riverbank Excavation	Cost
ROD	~364	~3.02 million	~\$1.05 billion
Proposed ESD	~347	~2.94 million	~\$1.015 billion
Change <i>From ROD to Proposed ESD</i>	~17 <i>4.67% decrease</i>	~80 thousand <i>2.66% decrease</i>	~\$35 million <i>3.33% decrease</i>

What does this mean for the Portland Harbor Superfund Site?



Legend

- Proposed (New) Remedial Area in ESD
- Remedial Area Change (Reduction) from ROD
- Navigation Channel
- Site Area

0 1,000 2,000 3,000 4,000
Feet



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How can I be involved?



- **Provide written comments to EPA on the proposed ESD until Friday, December 21:**
 - Send comments via **e-mail** to HarborComments@epa.gov
 - **Mail Comments:** Attn: Portland Harbor Superfund Comments, U.S. Environmental Protection Agency, 805 SW Broadway, Suite 500, Portland OR 97205
- **Review EPA's November 1st webinar recording of the proposed ESD presentation:** <https://bit.ly/2zqWell>
- **Review the full slide deck from EPA's November 20th in-person proposed ESD session:**
<https://semspub.epa.gov/src/document/10/100122434.pdf>
- **Visit EPA's Portland Harbor website for the most up-to-date information:** www.epa.gov/superfund/portland-harbor

#1: What is the difference between an Explanation of Significant Differences (ESD) and a Record of Decision (ROD) amendment?

#2: How common is it to issue an Explanation of Significant Differences (ESD) during the Superfund process?

#3: Who issued this change, what was the methodology, and who funded it?

#4: This **national** change upgrades Benzo[a]pyrene's status from 'probable human carcinogen' to 'human carcinogen.' Why then is EPA saying that BaP is about 7 times less toxic to human health than previously thought?

#5: For the Benzo[a]pyrene change, what does 7 times less potent mean? 7 times less than what?

#6: Did the **national** EPA Benzo[a]pyrene update consider children and infants who are more vulnerable (for both cancer and non-cancer effects)?

#7: Did the **Portland Harbor Superfund Site** take site-specific cancer & non-cancer BaP human health risk into account with this toxicity change? Were children and infants considered?

#8: How was wildlife or ecological health considered with this proposed ESD (both with the **national** BaP change and the **Portland Harbor specific** change)?

#9: Does this proposed ESD take into account mixtures of PAHs? I have heard that mixtures of PAHs may be more toxic than individual chemicals.

#10: Has there been a site-specific analysis in the area of Gasco and Terminal 4 with the combination of BaP and the other chemicals at the Site based on the new data and how the combination of those chemicals can affect people?



BONUS QUESTION!



BONUS: When we submit comments, what is EPA's responsibility to respond to the comments? What could cause EPA to reconsider this change?

More Questions?

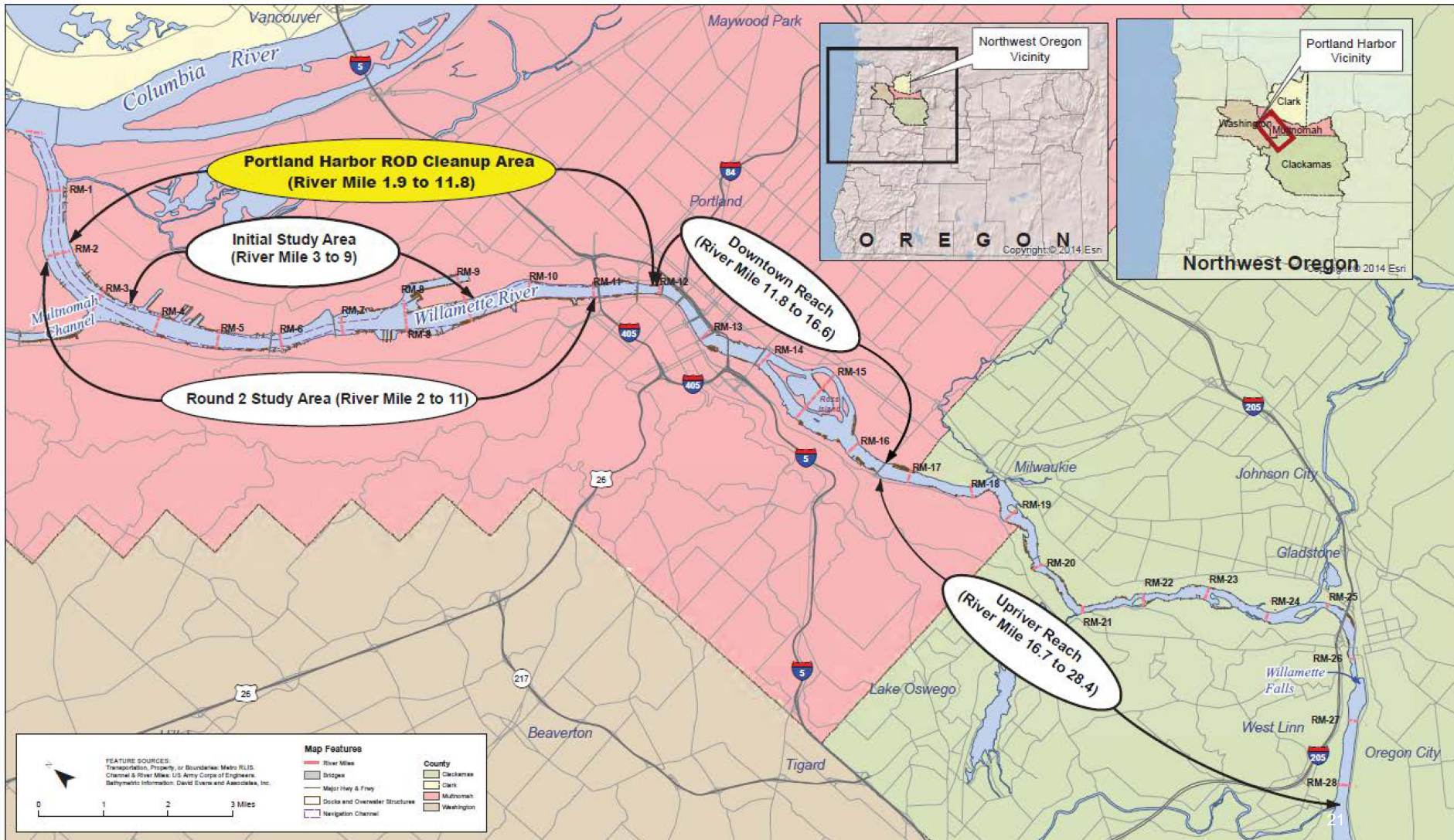


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Extra Slides

Site Background



Why did the Benzo(a)pyrene health risk change?



- EPA's Integrated Risk Information System (IRIS) updated their BaP assessment in 2017
- EPA's IRIS program has worked for over 10 years on this assessment
- The BaP IRIS assessment was extensively reviewed with many agencies and scientists (next slide)
- Current studies show that cancer risk for BaP is about seven times less toxic for people who contact or ingest the chemical

What is the EPA IRIS Program?

- **Created in 1985** to provide a database of human health assessments for chemicals
- **Goal:** Foster consistency in the evaluation of chemical toxicity across EPA

Who reviewed this BaP cancer health risk change?



- **Some of the other Agencies who reviewed:**
 - Agency for Toxic Substances and Disease Registry
 - Department of Defense
 - National Aeronautics and Space Administration (NASA)
 - National Institute for Occupational Safety and Health
- **Public comments:** Assessment released for public comment in 2013
- **Peer review by 27 independent, expert scientists including:**
 - University of Washington, Seattle WA
 - University of California, Irvine CA
 - University of New Mexico, Albuquerque NM
 - Harvard School of Public Health, Boston MA
 - The University of Texas at Austin, Austin TX
 - University of Illinois, Chicago IL
 - National Institute of Health, Bethesda MD
 - Department of Statistics and Evaluation, American Cancer Society, Atlanta GA

What are PRGs, PTW and RALs?



- **Cleanup Levels:** Long-term contaminant concentrations that the cleanup must achieve to meet the Remedial Action Objectives. These also may be referred to as Preliminary Remediation Goals (PRGs).
 - Developed for all contaminants of concern on a media-specific (sediment, water, clam tissue, etc...) basis
- **Highly Toxic Principal Threat Waste (PTW):** Contaminant source material that requires special management due to high toxicity
- **Remedial Action Levels (RALs):** Define areas where capping and/or dredging must be conducted to facilitate natural recovery throughout the site
 - Separate RALs established in Portland Harbor for Navigation Channel and nearshore sediments

What does this mean for the Portland Harbor Superfund Site?



★ = Affected by change

RAO		Media
H u m a n	RAO 1	Sediment ★
	RAO 2	Biota ★
	RAO 3	Surface Water
	RAO 4	Groundwater
E c o	RAO 5	Sediment
	RAO 6	Biota
	RAO 7	Surface Water
	RAO 8	Groundwater
H&E	RAO 9	Riverbanks

Remedial Action Objectives (RAOs)

- **RAOs:** Media specific goals for protecting human health and the environment
- Cleanup plan established RAOs and cleanup levels for sediment, groundwater, surface water, and river bank soils
- Any change in remedial action levels must consider impact on all RAOs

What does this mean for the Portland Harbor Superfund Site?

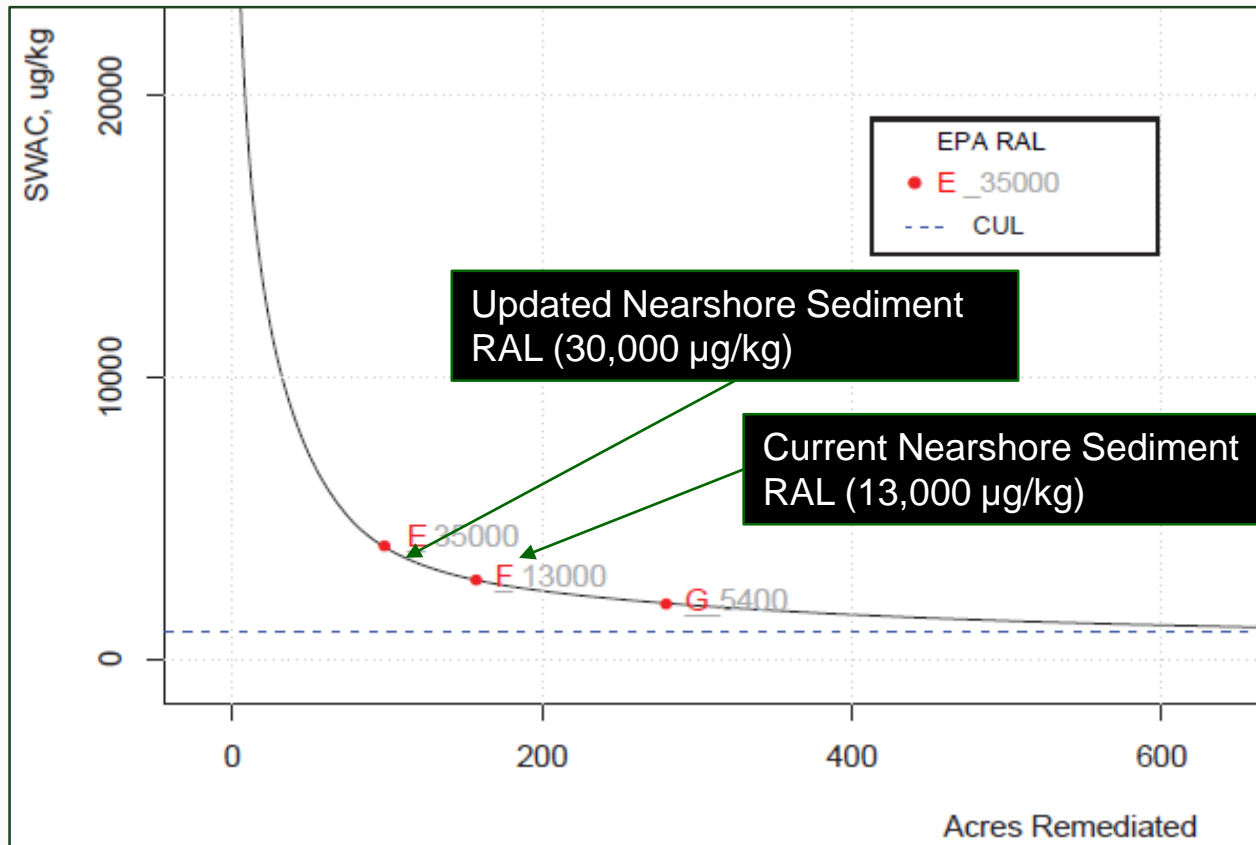


Scenario	Impacted Area	ROD Value	Updated Value
Direct Contact cPAH Beach Sediment cleanup level	Beach Areas	12 µg/kg (parts per billion)	85 µg/kg
Direct Contact cPAH In-Water Sediment cleanup level	Nearshore sediment (excluding beach areas)	Not Included (106 µg/kg)	774 µg/kg
Clam Tissue Consumption cPAH Target Level	Site-Wide	7.1 µg/kg	51.6 µg/kg
Clam Consumption cPAH Sediment cleanup level	Site-Wide	3,950 µg/kg <i>(This should have been 39.5 µg/kg)</i>	1,076 µg/kg
Benthic Risk total PAH Sediment cleanup level	Site-Wide	23,000 µg/kg	23,000 µg/kg <i>No Change Proposed</i>
Highly Toxic cPAH PTW Threshold	Site-Wide	106,000 µg/kg	774,000 µg/kg
Nearshore total PAH RAL	Nearshore Sediment (Outside the Navigation Channel)	13,000 µg/kg	30,000 µg/kg
Navigation Channel total PAH RAL	Navigation Channel Sediment	170,000 µg/kg	170,000 µg/kg <i>No Change Proposed</i>

Proposed Nearshore Total PAH RAL Change



- EPA proposes revising the total PAH nearshore RAL from 13,000 $\mu\text{g}/\text{kg}$ to 30,000 $\mu\text{g}/\text{kg}$:



Why did the proposed navigation channel total PAH RAL not change?



- **The total PAH navigation channel RAL of 170,000 $\mu\text{g}/\text{kg}$ will not change because of human health and benthic (critters that fish eat) risk that is present**
- **Other Issues:**
 - The navigation channel has benthic community habitat
 - The total PAH cleanup level of 23,000 $\mu\text{g}/\text{kg}$ is exceeded in the navigation channel between RM 5 – 7 with unacceptable risk to the benthic community
 - Natural recovery processes such as sediment deposition within the navigation channel are not happening for contaminated areas between RM 5 – 7
 - An increase in PAH loading to surface water is happening downstream of RM 6.3

Development of Human Health Clam Consumption Clean-up Levels

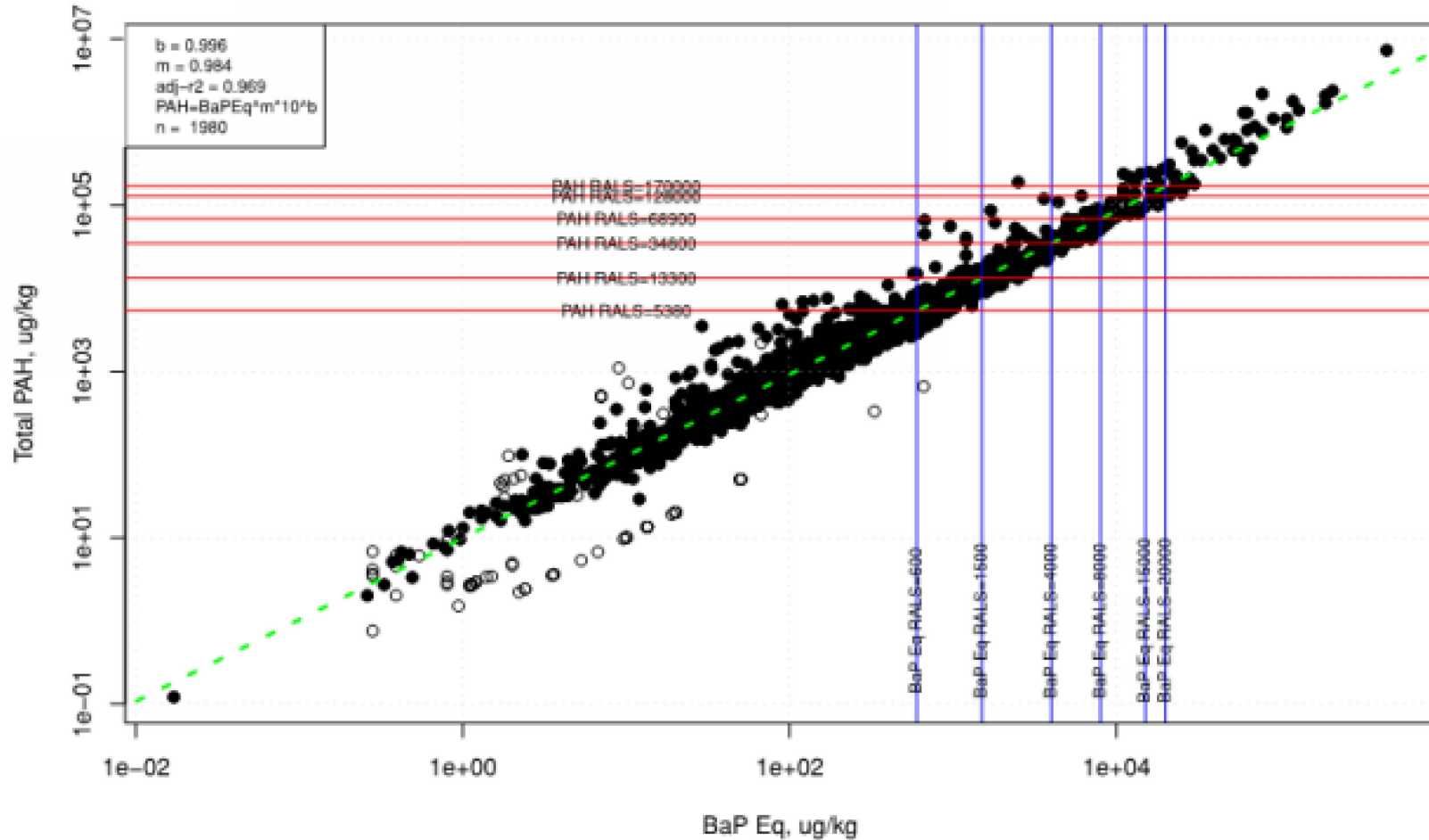


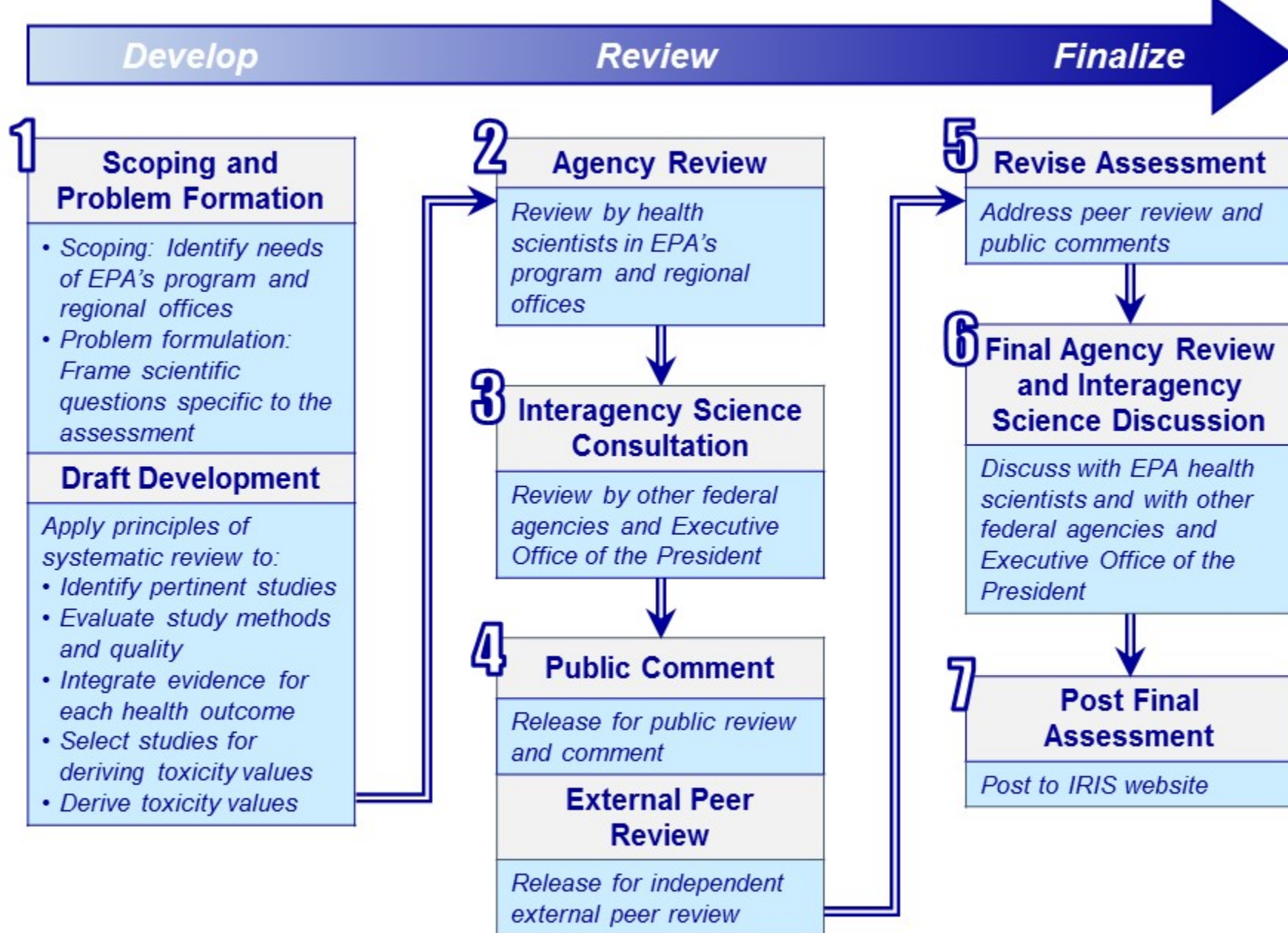
- The human health clam consumption target tissue level increases by a factor of 7.3 from 7.1 $\mu\text{g}/\text{kg}$ to 51.6 $\mu\text{g}/\text{kg}$ due to the BaP health risk change
- The relationship between cPAH (BaP Eq) clam tissue levels is a **non-linear** log-log relationship represented by the following equation:

$$\ln(PRG_{sed}) = \frac{((\ln(C_{tissue}) - (\ln(f_{lipid}) - \ln(CF) + 2.47))}{0.6} + \ln(f_{oc})$$

- Based on the non-linear relationship, the cPAH human health clam consumption CUL increases from 39.5 to 1,076 $\mu\text{g}/\text{kg}$ due to the BaP health risk change

Total PAH - cPAH Relationship





IRIS ASSESSMENT DEVELOPMENT PROCESS

The 7-step process has not changed. This figure refines earlier versions and includes the 2013 IRIS enhancements and the incorporation of systematic review approaches.

IRIS References for BaP Review



Approximately **700 references** cited in the Draft Toxicological Review

- Developmental toxicity: **37 references**
- Reproductive toxicity: **70 references**
- Immunotoxicity: **58 references**
- Other Toxicological Effects: **27 references**
 - Forestomach toxicity: **5 references**
 - Hematological toxicity: **3 references**
 - Liver toxicity: **3 references**
 - Kidney toxicity: **3 references**
 - Cardiovascular toxicity: **11 references**
 - Neurological toxicity: **12 references**
- Carcinogenicity: **171 references**
- Toxicokinetic: **115 references**
- Genotoxicity: **196 references**

Doesn't a decrease to 1 per mg/kg-day from 7.3 per mg/kg-day mean BaP is more carcinogenic?



- **Short Answer: No**
- **This decrease means that someone has less risk of developing cancer if they are exposed to BaP**

Cancer Risk = Lifetime Average Daily Intake x Cancer Slope Factor (CSF)

If **CSF** goes down, **Risk** goes down

- **However, the cleanup level may* increase (less restrictive) because one divides by the cancer slope factor (CSF):**

$$CUL_{\text{sediment}} = \frac{\text{Target Excess Cancer Risk} \times \text{Averging Time}}{\text{CSF} \times \text{Exposure} \times \text{Age Adjusted Dermal Contact} \times 10^{-6} \text{ kg/mg}}$$

- **Remedial Action Levels (RALs) may* also increase to prevent cleaning up sediments that do not pose unacceptable risk**

*Depends on the area within the Site

Has EPA updated health risk values to be less toxic for other chemicals?



- IRIS does not keep track of this type of information.
- IRIS evaluates the available data with current methodologies to interpret the currently available science as best we can.
- This evaluation can lead to characterizations of toxicity that may be relatively more or less toxic than previous characterizations.

Did EPA consider the non-cancer reference dose (RfD) change?



- **Short answer:** Yes, EPA previously considered the RfD change.
- **Long answer:**
 - The Toxicological Review of Benzo(a)pyrene (USEPA, 2017) also included a non-cancer oral reference dose of 0.0003 (mg/kg-day).
 - This value was utilized in the development of Preliminary Remediation Goals (PRGs) for the Portland Harbor Site (See Table B3-2 of the Portland Harbor Feasibility Study).
 - PRGs for non-cancer risk presented in Appendix B of the Portland Harbor Feasibility Study, are significantly higher than cancer risk and thus are not a factor for developing PAH Cleanup Levels at the Portland Harbor Site.

What was the exact cancer slope factor change for BaP?



PREVIOUS CSF	REVISED CSF* <i>*Revised January 19, 2017</i>
7.3 per mg/kg-day	1 per mg/kg-day

Application of Benzo(a)pyrene Potency Equivalence Factor



- The carcinogenicity of PAHs is assessed relative to benzo(a)pyrene using a potency equivalence factor (PEF)
 - PEFs range between 1 and 0.001 for individual carcinogenic PAHs
 - Allows estimation of total carcinogenic PAH risk measured as benzo(a)pyrene equivalents (BaPEq)
 - The BaP slope factor change affects all carcinogenic PAHs

Location	Chemical	EPC (ug/kg)	B(a)P CSF (mg/kg-day) ⁻¹	Potency Equivalent Factor	Adjusted CSF (mg/kg-day) ⁻¹	Daily Dose (mg/kg-day)	Cancer Risk
RM 7 West	Benzo(a)anthracene	2.2E+03	1	0.1	0.1	7.20E-07	7.E-08
RM 7 West	Benzo(a)pyrene	1.7E+03	1	1	1	5.50E-07	6.E-07
RM 7 West	Benzo(b)fluoranthene	4.5E+03	1	0.1	0.1	1.45E-06	1.E-07
RM 7 West	Benzo(k)fluoranthene	1.4E+03	1	0.01	0.01	4.60E-07	5.E-09
RM 7 West	Chrysene	-	1	0.001	0.001	-	-
RM 7 West	Dibenzo(a,h)anthracene	7.1E+02	1	1	1	2.30E-07	2.E-07
RM 7 West	Indeno(1,2,3-cd)pyrene	1.4E+03	1	0.1	0.1	4.50E-07	5.E-08
RM 7 West	Total cPAHs as B(a)P Equivalents						1.E-06

Evaluation of Children and Infants in the Portland Harbor HHRA



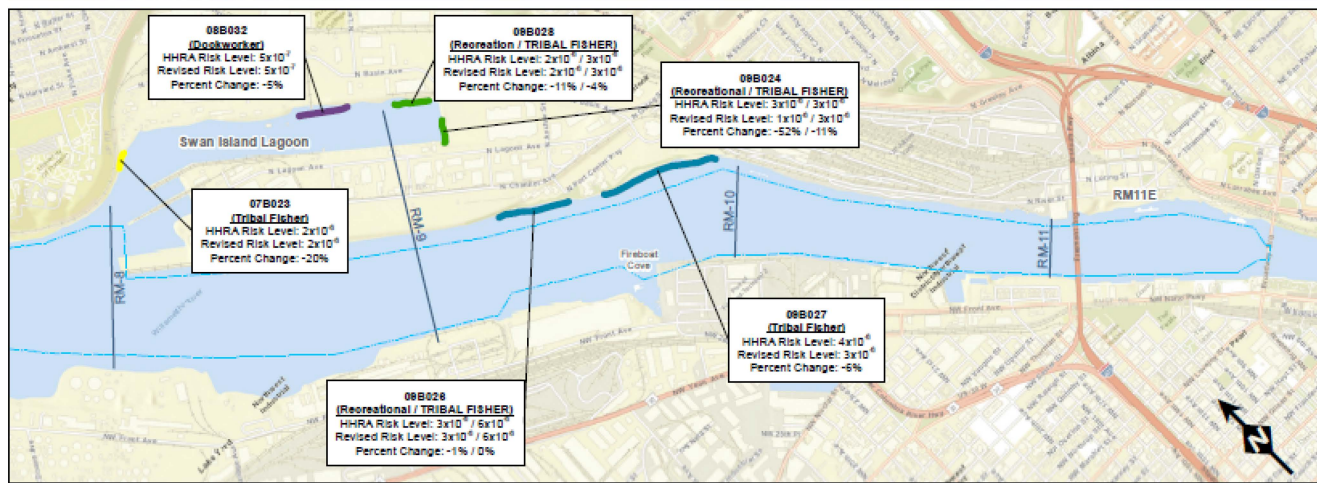
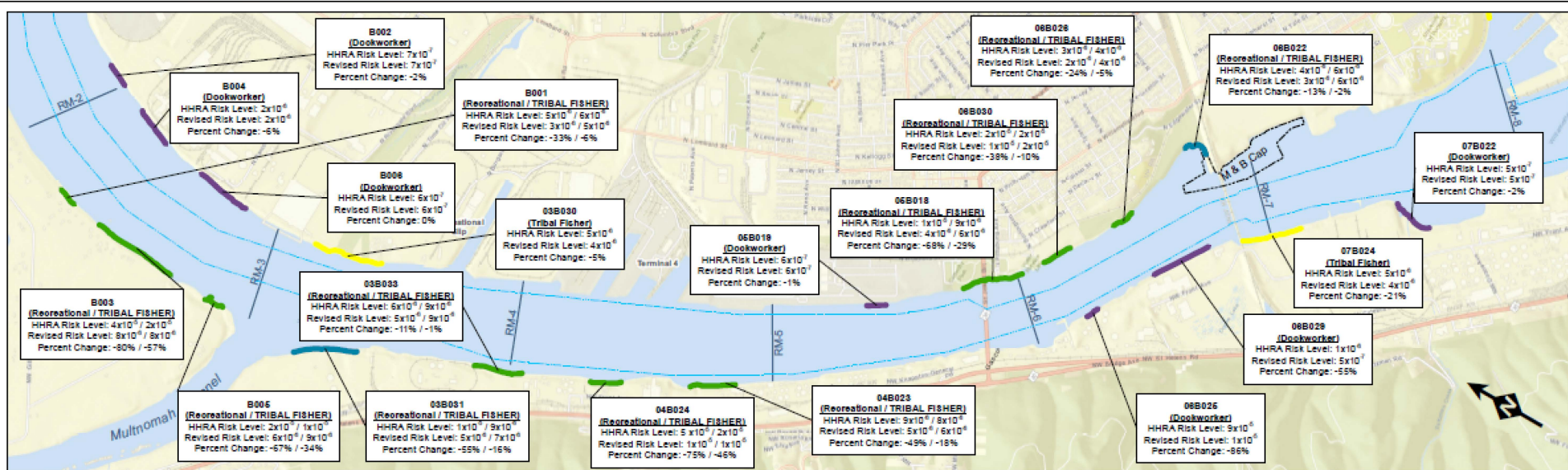
- **Carcinogens**

- The **Human Health Risk Assessment (HHRA)** evaluated a combined adult/child exposure scenario for recreational beach users and all fish consumption exposure scenarios
- The HHRA did not consider children in the clam and crayfish consumption exposure scenario

- **Non-carcinogens**

- The HHRA evaluated a child recreational beach user and all fish consumption exposure scenarios
- The HHRA evaluated breastfeeding Infants for all adult exposure scenarios for select bioaccumulative chemicals (PCBs, DDx, PBDEs, and dioxin and furans)
- The HHRA did not consider children in the clam and crayfish consumption exposure scenario

Human Health Beach Exposure



Legend

Human Health Beach Exposure Scenarios Evaluated¹

- █ Dockside Worker
- █ Recreational Beach User and Tribal, High Frequency and Low Frequency Fisher
- █ Transient and Tribal, High Frequency and Low Frequency Fisher
- █ Transient, Recreational Beach User and Tribal, High Frequency and Low Frequency Fisher
- Navigation Channel

Notes:
 1 - Maximum risk level presented for each beach location. The greater risk driver is shown in all caps when more than one exposure risk is shown. HHRA risk levels are taken from the baseline human health risk assessment (EPA 2016a). Revised risk levels are based on the revised cancer slope factor for Benzo(a)Pyrene.

0 1,000 2,000 3,000 4,000
 Feet

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