Recap of Jan 7, 2010 Human Health/Background Discussion

- Continue to explore the feasibility of Option 2 regional background approach.
- Explore Option 1 (MTCA approach) and the use of cost and feasibility during remedy selection.
- How to set cleanup standards that are technically achievable but still make progress towards a long-term, more conservative cleanup goal.
- How to resolve PLP liability.
- How do we get to final clean up when recontamination is not from the PLP?

Areas of adjustment

Set Cleanup Standard	Remedy Selection and Implementation	Resolution
•Consideration of background **• Exposure assumptions** **•Acceptable risk range or range of effects.**	**•Engineered controls** **•Institutional controls** **• Remediation Levels** **•Recovery Time Frame**	**•Compliance** **•Location** **•Concentration (Statistical comparison)** **•Time** **•Interim actions** **• Sediment Recovery Zones** **• Partial Settlements?**

Homework for February

- **What areas in the SMS have or do not have flexibility for making cleanups feasible and final?**

- **How can we use the following to reach a "natural" or "regional" background cleanup standard:**
  - **Remedial alternatives analysis**
  - **Cost and feasibility**
  - **Partial settlements**
  - **Institutional controls**
  - **Remediation levels**
  - **Recovery time frames**
  - **Sediment Recovery Zones**
  - **Points of compliance**
  - **Site definition**

Addressing *Bioaccumulative* Adverse Effects to Biota When Setting Sediment Cleanup Standards

Presenter: Laura Inouye

Bioaccumulatives: Ecological Risk Issue

How should we address bioaccumulative chemicals to:

- provide clear and predictable clean up standards
- to protect biological resources

Bioaccumulatives: Ecological Risk Issue

- SMS numeric criteria promulgated to protect the benthic community from acute and chronic effects.
- SMS numeric criteria do not specifically include a bioaccumulative exposure pathway.
- MTCA has a terrestrial ecological evaluation process.
- SMS process of addressing biological risk from bioaccumulatives not clearly addressed.

SMS addresses bioaccumulatives – but not clearly

- **WAC 173-204-100**

  (2) "The purpose of this chapter is to reduce and ultimately eliminate adverse effects on biological resources and significant health threats to humans from surface sediment contamination by:

  (3) "… identify surface sediments that have no adverse effects, including no acute or **chronic** adverse effects on biological resources and no significant health risk to humans"

- **WAC 173-204-200**

  (7) "**Chronic**" means measurements of biological effects …from bioaccumulation and biomagnification ….. may include mortality, reduced growth, impaired reproduction, histopathological abnormalities, adverse effects to birds and mammals, or other endpoints determined appropriate by the department"

Bioaccumulatives: Ecological Risk Options

- Continue using site specific approach to develop cleanup levels for bioaccumulative chemicals.
- Revise the SMS narrative standard to provide a clear decision process for bioaccumulatives.
- Revise the SMS narrative standard to provide a clear decision process for bioaccumulatives *and develop guidance*.
- Adopt numeric criteria.
- Adopt biological criteria.

Bioaccumulatives: Ecological Risk Narrative Standard Option

- This option would include:
  - a narrative standard for protection of biota from bioaccumulative effects
  - provide guidance for when and how to evaluate risk to ecological receptors.

Comparison of concentrations protective of ecological and human health

- Referenced from the Regional Sediment Evaluation Team Sediment Evaluation Framework (2009)
  - http://www.nwp.usace.army.mil/pm/e/rset/sef/2009-Final_SEF.pdf
  - Multi-Agency document, developed for assessment of sediments for dredging projects.
  - Peer Reviewed by staff from EPA, Corps, Ecology, ODEQ, IDEQ, NOAA/NMFS, FWS, IDEQ, DNR, and participating consultants.

- Human health risk based concentrations based on:
  - 54 g/day, 175 g/day and 584 g/day consumption
  - Risk = 1E-6 for carcinogens
  - Hazard Quotient = 1 for non-carcinogens

Comparison of concentrations protective of ecological and human health

- Ecological risk values based on:
  - Aquatic life: fish (including salmonids), gastropods, and other benthic invertebrates
  - Aquatic-Dependent wildlife: birds (eagle, osprey, heron, kingfisher, merganser, stilts, avocet, sandpipers) and mammals (river and sea otters, mink, harbor seals, Orca)

- Species Sensitive Distributions (SSD)

- Tissue Residue Values (TRV)

Target Tissue Levels (RSET)

bioaccumulative CoC	Aquatic life	Aquatic-dependent wildlife	Human		
			@54 g/day	@175 g/day	@584 g/day
Arsenic		2.7	***0.002***	***0.00027***	***0.00008***
Lead		2	NA	NA	NA
Mercury	0.11	***0.02***	0.13	0.04	***0.012***
Selenium	7.9	0.35	6.5	2.0	0.6
Tributyltin	0.02	8.2	0.39	0.12	0.036
Fluoranthene		3.8	52	16	0.48
Fluorene		410	52	16	4.8
Pyrene		3.8	39	12	3.6
Hexachlorobenzene			0.0019	***0.00025***	***0.000075***
Pentachlorophenol	***0.001***	8.1	0.025	***0.0033***	***0.001***
Total Chlordanes		0.26	0.0086	***0.0011***	***0.00034***
DDTs – Total	0.09	0.01	0.0089	***0.0012***	***0.00035***
Dieldrin		0.09	***0.00019***	***0.000025***	***0.000007***
Total Endosulfans			7.8	2.4	0.72
gamma-HCH (Lindane)			0.0023	***0.00031***	***0.000092***
Methoxychlor			6.5	2	0.6
Total PCB Aroclors	1.4 (lipid normalized)	0.04	***0.0015***	***0.0002***	***0.00006***
Dioxins/Furans/coplanar PCBs TEQ		***5.0E-07***	***2.30E-08***	***3.10E-09***	***9.20E-10***

bold red italicized values are below tissue analytical detection limits

Conclusions from RSET Study

- Chlorinated pesticides, PCBs, dioxin, fluorene, hexachlorobenzene are driven by human risk based concentrations at recreational consumption levels of 54 g/day (no change with 175 g/day).
- Mercury, fluoranthene, pentachlorophenol, and pyrene are also driven by human risk based concentrations at high end consumption rates (584 g/day).
- Many human health risk based concentrations are below tissue analytical detection limits.
- Lead, tributyl tin, and selenium are driven by ecological based concentrations even when compared to high consumption rate (584 g/day).

Discussion Questions

- Is the preferred option of a narrative standard the best choice considering staff and financial resource constraints?
- What are the salient points Ecology should consider to adequately write a clear narrative standard that provides a consistent process to set cleanup standards? See the next slide to get you started.
- Are there specific endpoints that must be included in the narrative standard?
- Is the RSET work sufficient to conclude that human health risk based concentrations are the main drivers for most bioaccumulatives?

What could go into guidance for deriving sediment standards from Target Tissue Levels for protection of ecological receptors?

- Develop target tissue levels based on conceptual site model (what receptors are present).
- To determine site specific availability and if bioaccumulation is a concern, tissue levels can be analyzed by collecting benthic organisms or conducting laboratory bioaccumulation assays. (note that tissue levels could be compared to either TTL or tissue concentrations from reference areas)
- For non-polar organic compounds, safe sediment levels for target tissue levels can be developed using a rigorous model (such as the Gobas model) with site specific data.
- For polar organic or metals, safe sediment levels based on target tissue levels can be calculated by developing BAFs with site specific data.