Risk Assessment in the RI/FS process, and derivation of cleanup levels

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Presentation to the RAP committee
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Risk Assessment - Basics

- Baseline Risk Assessment evaluates the basis for action – is there risk that warrants action?
- Risk assessment identifies contaminants of potential concern
- Risk assessment provides a foundation for setting cleanup levels
Risk Assessment – River Corridor

• River Corridor Baseline Risk Assessment
  – Human Health
  – Ecological

• Columbia River Component Risk Assessment
  – Human Health
  – Ecological

• Supplemental Risk Assessment in the RI/FS
  – Updated EPA guidance
  – Additional waste sites
  – Specific to the operable units
  – Integrated with other RI/FS chapters – Conceptual Site Model, fate and transport, remedial action objectives
Human Health Risk Assessment

• Multiple “scenarios” were evaluated, each with different exposure assumptions

Examples:
• Industrial: 40 hrs/week, 50 weeks/year, 25 years, soil ingestion, dust inhalation, skin absorption, external radiation
• Subsistence Farmer: 30 years; soil ingestion, dust inhalation, skin absorption, external radiation, home-grown beef, milk, vegetables, fruit
Preliminary Remediation Goals
Human Health

• Consistent with IARODs

• MTCA B Direct Contact PRGs for chemicals
  – Soil Ingestion at 10^{-6} (1 per 1,000,000) increased cancer risk
  – Soil ingestion at a hazard quotient of 1
  – Inhalation at 10^{-6} increased cancer risk
  – Inhalation at a hazard quotient of 1

• Rural Resident PRGs for radionuclides
  – Multiple pathways at 10^{-4} (1 per 10,000) increased cancer risk
MTCA B compared with Rural Residential

• MTCA B Direct Contact PRGs for chemicals
  – Six years, No homegrown food
  – $10^{-6}$ cancer risk
  – Hazard quotient of 1

• Rural Resident PRGs for radionuclides
  – Thirty years, All food homegrown
  – $10^{-6}$ to $10^{-4}$ cancer risk (not 15 mrem/dose)
  – Hazard quotient of 1
Human Health Risk Assessment
100-K sites, direct contact

• No remediated sites exceeded Human Health PRGs in top 15 feet.

• Three remediated sites exceeded Human Health PRGs below 15 feet.
  – No exposure pathway below 15 feet
  – Information used to restrict future excavation
Ecological Risk Assessment

• Multiple receptors were evaluated, including plants, terrestrial invertebrates, birds, mammals, fish, aquatic invertebrates

• Contaminants were screened using conservative screening levels
  – No effect below SSL
  – May be effects above SSL
Ecological Risk Assessment

• Contaminants were compared to more realistic benchmarks – concentrations that may be toxic and cause adverse effects
• The benchmarks used were the PRGs developed in the risk assessment.
• Other lines of evidence are also used:
  – Tissue residue concentrations indicating exposure
  – Population evaluations
  – Physical condition (size, species composition, community evaluations, reproductive status)
Bird and Wildlife PRGs

• Screening Level – conservative assumptions, sensitive species, typically with highly bioavailable contaminant forms and exposure conditions.

• Tier 1. More site-specific species. Established models of exposure and literature toxicity values are used.

• Tier 2. More site-specific food (prey or vegetation) data is used in the models.
Bird and Wildlife PRGs

- Refinement from Tier 1 to Tier 2 is limited to the extent and quality of information available.
- Tier 2 can be higher or lower than Tier 1.
- Sometimes Tier 2 has high uncertainty and can’t be used.
**Bird and Wildlife PRGs - Examples**

- **Mercury**

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- **Lead**

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Plant and Invertebrate PRGs

• Conducted site-specific bioassays
• Collected soils from the site
• Grew plants and exposed invertebrates
• Evaluated survival, growth, and reproduction
• Proposing the highest No Effect values as PRGs
• Typical effect level for plant and invertebrate would be Low Effect. We did not have sufficient effect data to propose Low Effect thresholds for PRGs
Table 8.3

• Human Health PRGs in 100 area will be the same between Operable Units

• Groundwater and Surface Water protection PRGs will be different between OUs because of OU-specific conditions. We have agreed on a uniform 2 mg/kg for hexavalent chromium.

• Use of irrigation is an unresolved land use issue. Model for % of vadose zone contaminated is key.

• Ecological PRGs will be evaluated in the context of relevant exposure areas for receptors
Other topics

- ARARs
- Interim action used 1:1 GW to river dilution. Final actions propose no dilution.
- PRGs calculated for individual contaminants. Sites must also meet cumulative risk limits.
- Proposed Plan is a tool to solicit public input. The subsequent document is the ROD (no revised Proposed Plan after public comment).