RCBRA
Ecological Risk Assessment Overview

Hanford Advisory Board
River and Plateau Committee

October 2011
Purpose

- River Corridor Baseline Risk Assessment – Ecological Risk Assessment Draft C (RCBRA-Eco) has been submitted to the Regulators
  - Information presented forms the basis for ecological risk in the River Corridor RI/FS documents
    - The RCBRA-Eco is an evaluation across the River Corridor
    - The RI/FS documents use Operable Unit-specific information from the RCBRA-Eco
    - RI/FS documents also evaluate OU-specific information to further refine risk assessment information.
RCBRA Ecological Risk Assessment

• Evaluates ecological risk for current conditions in upland, riparian and near shore environments
  – Evaluates remediated sites and affected areas to determine if cleanup under the interim RODs is protective of the environment
  – Provides “Basis for Action” for cleanup of waste sites
  – Provides Ecological Preliminary Remediation Goals (PRGs)
    • Risk-based soil concentrations that are protective of ecological receptors
  – Provides recommendations for consideration in the RI/FS and other actions at the Hanford site
Ecological Study Zones

- Upland Zone
- Riparian Zone
- Near-Shore Zone
Sampling Summary

• Characterizes potentially contaminated media in the upland, riparian, and near-shore environmental zones

  – Surface surveys, fly over data, and groundwater plume maps used to guide potentially contaminated areas
    • 20 remediated waste sites (and 10 reference sites) in the upland zone
    • 18 potentially affected areas (and 7 reference sites) in the riparian zone
    • 48 potentially affected areas (and 9 reference sites) in the near-shore zone

  – Data set includes over 165,000 sample data results, including results from the 100-B/C and 100-NR-2 ERAs
Sampling Summary (cont’d.)

[Map of sampling sites with various symbols indicating different types of sample sites, such as upland sample sites, riparian sample sites, and aquatic sample sites.]
Sampling Summary (cont’d.)

• Sample design provides multiple line of evidence at each study site
  • Abiotic – soil, sediment, surface water, pore water
  • Biotic – plants, terrestrial invertebrates, small mammals, birds, aquatic invertebrates, fish found along shoreline (sculpin, suckers)
Evaluation Methods

• Analyzed for suites of analytes based on results of Screening Level Ecological Risk Assessment (SLERA) and Data Quality Objectives (DQO)
  – Included radionuclides, inorganics, semivolatile organics, herbicides, pesticides, and PCBs

• Identification of Contaminants of Potential Concern (COPC)
  – Statistical comparison to background and reference concentrations
  – Specific evaluation based on reference data, sample locations, biotic media
• Contaminants of Potential Ecological Concern (COPEC)
  – PAHs evaluated individually and additively
  – Radionuclides evaluated using Biota Concentration Guides
  – All other COPCs evaluated individually against conservative screening levels
    • Washington Administrative Code screening values
    • EPA Ecological Soil Screening Levels
    • Ambient Water Quality Criteria
Evaluation Methods (cont’d.)

• COPEC Refinement
  – Literature based benchmarks
    • Washington Administrative Code screening values
    • EPA Ecological Soil Screening Levels
    • Ecological literature and toxicity studies
  – Toxicity tests using site-specific media
    • Sandberg’s Bluegrass and Nematode survival in soil
    • *Hyalella* survival in sediment
    • Clam and *Ceriodaphnia* survival in pore water
    • Frog Embryo Tests in pore water
Results (cont’d.)

• Upland Zone
  – 39 COPECs based on initial screening
  – COPEC refinement identified 8 Contaminants of Ecological Concern (COEC)

• Riparian Zone
  – 22 COPECs based on initial screening
  – COPEC refinement identified 6 Contaminants of Ecological Concern (COEC)

• Near-Shore Zone
  – 22 COPECs based on initial screening
  – COPEC refinement identified 5 Contaminants of Ecological Concern (COEC)
Results

Contaminants Indicating Potential Risk to River Corridor Ecological Receptors

- Concentrations exceed levels that may cause observable effects
- Ecological preliminary remediation goals for soil are proposed that are protective of the receptors

**Riparian Zone**
- **Plants:** Arsenic*, chromium, lead, zinc*
- **Invertebrates:** Chromium, mercury*, zinc*, Total Petroleum Hydrocarbons (TPH)
- **Wildlife:** Zinc*

**Upland Zone**
- **Plants:** Antimony*, arsenic*, boron, lead
- **Invertebrates:** Barium, copper, mercury
- **Wildlife:** Copper, lead, dieldrin*

**Near-Shore Zone**
- **Aquatic Plants and Invertebrates:** Cadmium*, chromium, hexavalent chromium, manganese*, uranium
- **Amphibians:** Hexavalent chromium
- **Fish:** Hexavalent chromium
- **Wildlife:** Chromium

*Lacks a clear tie to Hanford releases.*
Ecological Preliminary Remediation Goals

- Proposed for inorganic, organic, and radionuclide Hanford contaminants in soil
- PRGs developed reflect protection of Hanford receptors
- PRGs for plants and invertebrates based on a graded approach using screening values, bioassay results, and literature values
- PRGs for wildlife (birds and mammals) based on dietary intake and incidental soil ingestion models
- PRGs carried forward into RI/FS