

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

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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

	California Quail	Meadowlark	Killdeer	Red-Tailed Hawk
SSL	5.5 wildlife	5.5 wildlife	5.5 wildlife	5.5 wildlife
Tier 1	36	21	4	134
Tier 2	36	4.7	2.0	92

- Lead

	California Quail	Meadowlark	Killdeer	Red-Tailed Hawk
SSL	118 wildlife 11 bird	118 wildlife 11 bird	118 wildlife 11 bird	118 wildlife 11 bird
Tier 1	537	115	36	2433
Tier 2	559	664	156	2300

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).