

# HANFORD NATURAL RESOURCE TRUSTEE COUNCIL

## FINDING 06-01

### **Purpose of “Reference Sites”**

Reference sites play an important role in both the ecological risk and injury assessments aiding regulatory agencies and natural resource trustees in their respective decision-making roles under CERCLA in achieving restoration.

Reference sites aid investigators in assessing the environmental condition of a Superfund site. Reference data provide important information to the remedial action project manager and others to make an informed decision of whether hazardous and radiological contaminant effects appear to exceed the natural changes in the components typical of similar non-site, unimpacted areas. Planners also can use reference site data in the restoration phase of the remedial effort.

Under the remedial response and natural resource damage assessment processes, regulatory agencies and the trustees share a common goal to define the geographical extent of hazardous substance releases and assess threats to receptors and resources from those releases. Thus, it is in the interest of all parties to select appropriate reference sites and work cooperatively toward that goal.

### **HNRTC definition of reference site**

The trustees have relied substantially on EPA guidance and supplemental guidance language to define the term “reference site” as follows:

A reference site is an area absent of site contaminants and undisturbed, or minimally disturbed, that provides a comparison for site contaminant levels, and has the same basic characteristics (e.g., physical, chemical, geological, and biological) as the medium of concern at the Superfund site, and lies at a great enough distance from the Superfund site to be outside its sphere of influence.

### **General criteria**

In addition to the meaning above, several general criteria must be considered in selecting reference sites, and include:

- Consistency with ARARs or consent orders, e.g. the Tri-Party Agreement

- There must be sufficient numbers of reference locations, and samples to perform the desired statistical analysis or desired level of statistical power.
- The reference and contaminated site should be independent of each other.
- The reference site must be outside the regional zone of deposition from past hazardous substance releases from Hanford via particular transport mechanisms, such as, air emissions from 100, 200, and 300 area facilities as determined by Hanford deposition data.
- The site must be representative of regional and local climatic conditions.

### **Specific Attributes**

In addition to the definition and general selection criteria cited above, investigators also need to consider specific site attributes for each medium of concern. Attributes including those listed in the box below should be matched as closely as possible when selecting a reference site.

<b>Medium</b>	<b>Specific Attributes</b>
Ground water	up gradient of contaminant plume preferably on the same groundwater flow path; unimpacted by anthropogenic affects (Hanford/other); similar soil/sediment stratigraphy; same aquifer with similar physical characteristics (confined or unconfined); not affected by hydraulic connection to other aquifers that could affect water quality, or geochemistry of aquifer system pH and conductivity
Biological	species abundance, species richness, diversity, trophic structure, habitat, substrate type
Soil	soil depth and type, particle size distribution, organic matter content, hydrologic regime, and pH; if possible, site should be the same soil map unit or soil series
Sediment	organic content, particle size distribution, clay content and type, redox characteristics, cation exchange characteristics, and pH
Surface water	flow regime (channel structure and gradient, discharge, velocity, depth), temperature regimes, depth and intensity of light penetration, dissolved oxygen concentrations and dynamics, water chemistry (pH, hardness, alkalinity, and nutrient concentrations)
Air	located outside zone of deposition of past and current air emissions, wind direction, speed, and moisture and temperature regime.