Remedial Investigation of Hanford Site Releases to the Columbia River – 9485

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ABSRACT

In south-central Washington State, the Columbia River flows through the U.S. Department of Energy Hanford Site. A primary objective of the Hanford Site cleanup mission is protection of the Columbia River, through remediation of contaminated soil and groundwater that resulted from its weapons production mission. Within the Columbia River system, surface water, sediment, and biota samples related to potential Hanford Site hazardous substance releases have been collected since the start of Hanford operations. The impacts of Hanford Site hazardous substance releases to the Columbia River in areas upstream, within, and downstream of the Hanford Site boundary have been previously investigated as mandated by the U.S. Department of Energy requirements under the Atomic Energy Act. The impacts are now being assessed under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* [1] via a remedial investigation.

The *Remedial Investigation Work Plan for Hanford Site Releases to the Columbia River* [2] has been developed and issued to initiate the remedial investigation. The work plan establishes a phased approach to characterize contaminants, assess current risks, and determine whether or not there is a need for any cleanup actions. Field investigation activities began in October 2008 and are anticipated to continue into Fall 2009 over a 120 mile stretch of the Columbia River. Information gained from performing this remedial investigation will ultimately be used to help make final regulatory decisions for cleaning up Hanford Site contamination that exists in and along the Columbia River.

INTRODUCTION

A primary objective of the Hanford Site cleanup mission is protection of the Columbia River, through remediation of contaminated soil and groundwater that resulted from its weapons production mission. These remedial actions were initiated under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) [1] in 1994 and continue today, with an emphasis on activities in the "River Corridor" because of its proximity to the river and presence of the former production reactors in the 100 Area and fuel fabrication and development facilities in the 300 Area (Fig. 1).

Within the Columbia River system, large amounts of surface water, sediment, and biota data potentially related to Hanford Site contaminant releases have been collected since the start of operations through various sampling and monitoring programs. Areas upstream, within, and downstream of the Hanford Site boundary have also been investigated per U.S. Department of Energy orders. The impacts of Hanford Site releases to the Columbia River are now being formally assessed under CERCLA via the RI activities described the *Remedial Investigation Work Plan for Hanford Site Releases to the Columbia River* [2].

Purpose and Scope

The remedial investigation is being performed in accordance with the *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* [3]. The purpose of the remedial investigation is to:

- Characterize the nature and extent of Hanford Site-related contaminants that have come to be located within the Columbia River

- Assess the current risk to ecological and human receptors posed by Hanford Site-related contaminants.

- Determine whether or not any cleanup actions are needed to lower the risk to ecological or humans receptors from being exposed to Hanford Site-related contaminants.

The remedial investigation scope focuses on the impacts of Hanford Site releases to the Columbia River and its users. In order to evaluate the impacts from Hanford Site releases, it is equally important to understand the contributions of non-Hanford Site influences to the Columbia River upstream, within, and downstream of the Hanford Site. The risk assessment activities performed as part of this work plan will become an integrated component of the existing risk assessment activities in the River Corridor that focus on soil and groundwater.

Physical Setting

The Columbia River stretches 2,000 km (1,243 mi) from the Canadian province of British Columbia through the U.S. State of Washington, forming much of the border between Washington and Oregon, before emptying into the Pacific Ocean. Measured by the volume of its flow, the Columbia River is the largest river flowing into the Pacific from North America and is the fourth-largest river in the United States.

In south-central Washington State, the river flows through the U.S. Department of Energy Hanford Site (Figure 1). The Columbia River is the dominant aquatic ecosystem on the Hanford Site and supports a large and diverse population of plant and animal communities, as well as providing many recreational opportunities.

Most of the Columbia River within the United States is impounded by 11 dams. Seven of these dams are located upstream and four are downstream of the Hanford Site. An area known as the Hanford Reach is a 51-mile stretch of the Columbia River that flows unimpeded between the Priest Rapids Dam to the head of Lake Wallula upstream of McNary Dam. The Hanford Reach is the only free-flowing portion of the river above Bonneville Dam in the United States.
Three tributaries enter the Columbia River between the Hanford Site and the McNary Dam. Beginning with the furthest upstream, these tributaries are the Yakima, Snake, and Walla Walla Rivers.

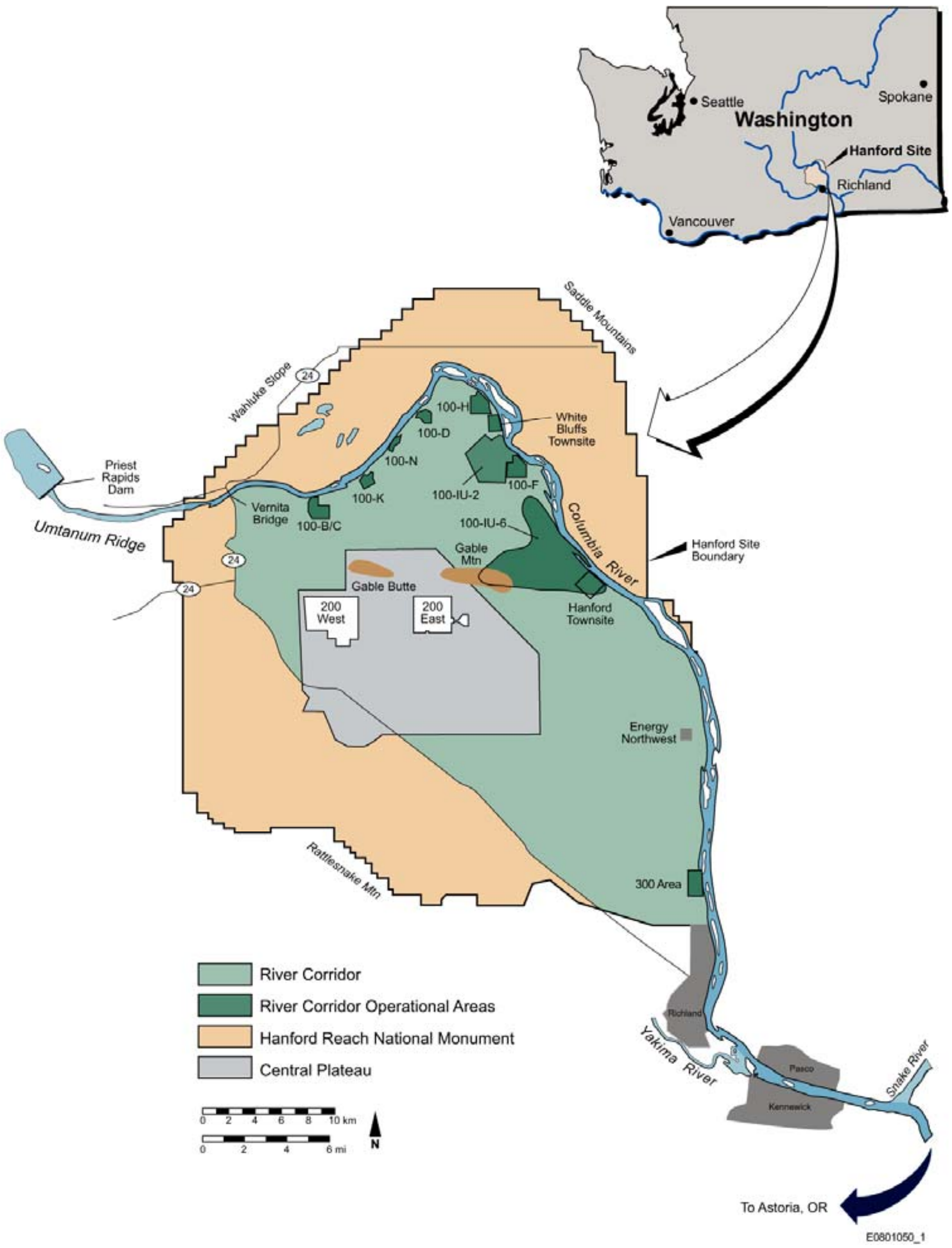

Fig. 1. Hanford Site River Corridor.

Hanford Site History

The Hanford Site became a federal facility in 1943 when the U.S. Government took possession of the land to produce weapons-grade plutonium during World War II. During five decades of Hanford Site operations and nuclear material production, large quantities of by-products were discharged to the environment. Liquid effluents from plutonium production reactors were discharged directly to the Columbia River and unplanned overland flows from retention ponds and basins occasionally occurred. In addition, plumes of contaminated groundwater developed in portions of the Hanford Site as a result of waste disposal practices and subsequent migration through the soil. Some of these contaminated groundwater plumes have reached the Columbia River, discharging as springs along the shoreline and upwelling through the river bottom.

Hanford Site production activities continued until the late 1980s, when the mission focus changed to cleaning up the radioactive and hazardous wastes that had been generated during the previous decades. In 1989, areas of the Hanford Site were placed on the National Priorities List under CERCLA authority, leading to the cleanup actions that are under way today.

INITIAL EVALUATION AND SCOPING

The federal government has extensively monitored the environment within, adjacent to, and "downwind" of the Hanford Site from the beginning of operations in the 1940s through the present. Radioactivity from the Hanford Site has been measured at detectable levels in various media (soil, sediment, biota, groundwater) over a large regional area. Most of this detectable radioactivity has largely decayed away over the years due to the short half-lives associated with many of the isotopes that were released.

To begin scoping the remedial investigation, an extensive data compilation effort was performed between 2004 and 2006 to identify and organize the results from previous investigations and programs, as documented in the *Columbia River Component Data Evaluation Summary Report* [4]. The compiled data includes results from more than 5,900 surface water samples, 1,400 sediment samples, and 7,000 biota (fish, shellfish, waterfowl) samples. The compiled data was then further evaluated with the purpose of identifying potential data gaps to be addressed during the remedial investigation. Results of this evaluation and the associated data gaps were summarized in the *Columbia River Component Data Gap Analysis* report [5].

Current activities in the River Corridor include performance of a baseline risk assessment of upland, riparian, and near-shore zones. Assessment of current groundwater conditions is also included. The assessment began in 2004 and includes evaluation of potential impacts to ecological and human receptors. In the near-shore zone, the assessment is supported by results from more than 100 surface water samples, 190 pore water samples, 190 sediment samples, and 160 biota (amphibians, aquatic macroinvertebrates, clams, mussels, fish) samples. It is anticipated that the *River Corridor Baseline Risk Assessment Report, Source and Groundwater Component* [6] will be issued in 2009.

Conceptual Site Model

The CSM identifies the sources of contamination, migration and exposure pathways, and applicable receptors. Elements of the CSM for Hanford Site releases to the Columbia River are summarized in Table I. The CSM will continue to be refined throughout the RI/FS process as new information becomes available.

Table I. Conceptual Site Model Elements.

CSM Element	Model Inputs

CSM Element	Model Inputs
Contaminant sources	**Hanford Site**: Past reactor cooling water discharges, limited overland flow, contaminated groundwater seepage to the Columbia River, and sediment deposition/redeposition. **Non-Hanford Site** (upriver and within study area): Mining operations, smelting, pulp and paper production, runoff from cities and agricultural areas, treatment plants, atmospheric nuclear testing, commercial or recreational vessel operation.
Release mechanisms and migration	Infiltration, percolation, and leaching from upland soils; direct discharge of reactor effluents; unplanned surface runoff; dust generation through wind and during facility operation; and biota uptake.
Exposure pathways	Dermal contact, incidental ingestion, external radiation, biota/fish consumption, vapor and dust inhalation (human health only).
Potential receptors	**Ecological:** Wide array of flora and fauna, with fish and benthic invertebrates being likely to have the greatest potential exposure to site contaminants in surface water and sediment. **Human:** Native Americans, recreational users (e.g., swimming, boating, beach going, fishing).

Data Quality Objectives

A data quality objectives (DQO) process began in 2007 with a comprehensive review of previous investigations and existing data. This review was presented in the data gap analysis report [5]. A series of interviews were then conducted with representatives from the Tri-Parties, Tribal Nations, Natural Resource Trustee Council, and Hanford Advisory Board. The input from these interviews was tabulated in a matrix and used to refine development of the DQOs. In addition, two public workshops (February and April 2008) were held to provide updates and receive feedback on the DQO and remedial investigation scoping process. The DQOs developed to support this remedial investigation are presented in the *DQO Summary Report for the Remedial Investigation of Hanford Site Releases to the Columbia River* [7].

Characterization and Data Needs

Although there has been extensive environmental monitoring and general trends that reflect decreasing concentrations, gaps in the spatial knowledge of environmental impacts from Hanford Site operations exist. Site characterization and data needs were identified based on process and operational knowledge, review of the existing data, an understanding of the contaminant transport mechanisms, and input received from the DQO interviews and workshops. These needs include collection of supplemental data to characterize Hanford Site releases to the river and to support evaluation of exposure pathways, media-specific exposures, and risk calculations.

Study Area Boundaries

Study area boundaries were developed based on the review of existing data along the entire Columbia River below the upstream boundary of the Hanford Site, river hydrodynamics and bathymetry, Hanford Site operational history, and dam construction timelines. The geographical study area for this work plan includes a 120 mile stretch of the Columbia River and Islands from above the Wanapum Dam to McNary Dam (the first downriver dam from the Hanford Site), plus a limited investigation of the area immediately upstream of Bonneville Dam. Limited sampling is planned in the vicinity of the Bonneville Dam to address potential deposits that may have occurred prior to the construction of McNary Dam. Construction of Bonneville Dam started in 1935 and was completed in 1937, several years before Hanford Site operations started. As an initial way of organizing the work, the study area has been divided into five sub-areas based on proximity to the Hanford Site and the relation of associated production operations. These five sub-areas include the upriver, 100 Area, 300 Area, and Lake Wallula (downriver), and Bonneville Dam Pool segments (Fig. 2).

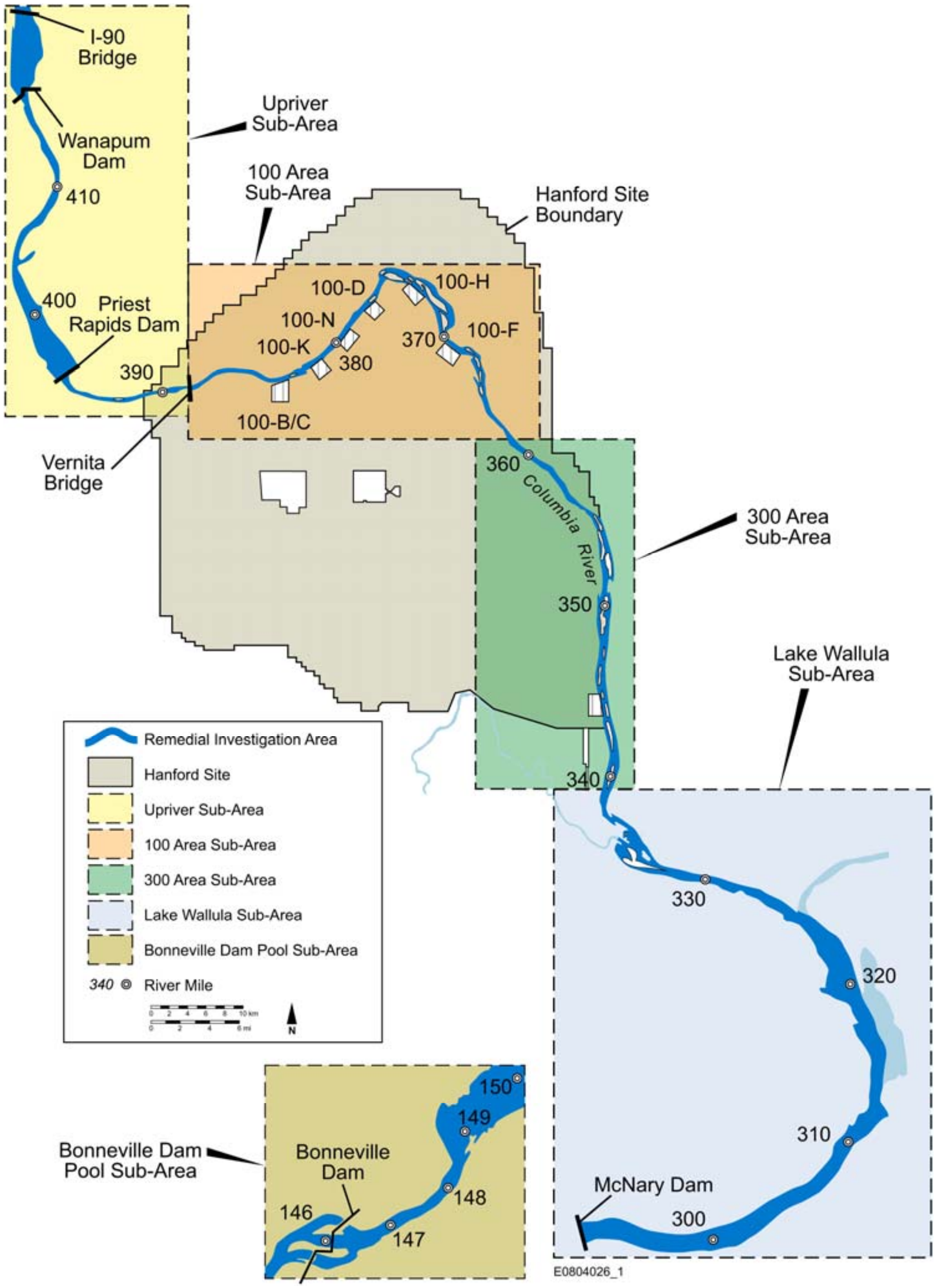

Fig. 2. Remedial Investigation Area.

The lateral study area of the Columbia River extends shore to shore (ordinary high water mark to ordinary high water mark[1]), except for the "near shore" areas within the Hanford Reach that have been previously characterized and assessed by the source and groundwater component of the river corridor baseline risk assessment (RCBRA). In these areas of the Hanford Reach, the study area begins where the Source and Groundwater Component of the RCBRA investigation left off at the near shore.

FIELD INVESTIGATION

The field investigation is designed to fill the data gaps and characterization needs that have been identified as part of the DQO scoping process. Elements contributing to the field investigation design include information compiled from previous investigations, the CSM assumptions, and outcomes of the DQO process. The field investigation emphasizes information gathering for sediment areas not addressed by previous environmental monitoring, augmenting previous core data behind downstream dams that did not show contamination, and sampling of fish species commonly consumed by humans.

Because of the large volume of existing data that is available and due to the large size of the study area, the field investigation design is stratified to address locations where:

- Hanford Site contaminants are most likely to be present. Examples include locations where build up of sediments exist on the river bottom downstream of Hanford Site reactors and behind the first downstream dam, islands, and areas where contaminated groundwater is upwelling in the river bottom.
- People use the Columbia River for recreational and other activities. Examples include islands, shoreline parks and beaches, boat launches, and other public access points.
- Areas where non-Hanford Site contaminants are most likely to be present, because it is important to help understand background conditions that are introduced into the investigation area. Examples include areas upriver from the Hanford Site, irrigation returns, and locations where other rivers enter the Columbia River.

An additional emphasis of the field investigation is further delineation and characterization of areas where contaminated groundwater is upwelling in river bottom through the Hanford Reach. These activities will build on similar work that was done in the near-shore for the source and groundwater component of the RCBRA.

The primary media to be sampled during the field investigation include surface water, pore water, sediment, soil, and fish. Sediment includes shallow, deep, shallow core, and deep core samples. The anticipated sample quantities and locations are summarized by media in Table II. For samples influenced by the presence of upwelling contaminated groundwater, the number of samples and specific sample locations will be refined by the results of the investigations that are planned to better delineate where the upwelling is occurring.

Table II. Sample Design Summary.

[1] "The ordinary high water mark on all lakes, streams, and tidal water is that mark that will be found by examining the bed and banks and ascertaining where the presence and action of waters are so common and usual, and so long continued in all ordinary years, as to mark upon the soil a character distinct from that of the abutting upland…" [8]

Medium	Quantity	Sample Type	Description
Groundwater plume upwelling	45[a]	Pore water	Pore-water samples will be collected in situ 0 - 0.3 m below mudline.
	45[a]	Sediment	Deep sediment samples collected in areas directly adjacent to known or suspected groundwater plume upwellings.
	45[a]	Surface Water	Deep surface water samples collected in areas directly adjacent to known or suspected groundwater plume upwellings.
Surface water	59	Surface water	Reactor areas, 300 Area, recreational locations (parks, boat launches), Lake Wallula, McNary Dam, irrigation returns, tributary deltas (Yakima, Snake, Walla, Walla). Samples collected at two-thirds the depth of the water column.
	3	Deep surface water	Samples collected from directly above the riverbed.
Sediment	217	Shallow sediment samples (i.e., submerged)	Irrigation returns, downriver islands, shoreline, tributary deltas (Yakima, Snake, and Walla Walla), other depositional areas between reactors and McNary Dam. Samples collected from the upper 10 cm of the sediment (e.g., generally submerged).
	284	Shoreline sediment	Samples collected from the upper 10 cm of the lower riparian zone, typically the area devoid of terrestrial vegetation.
	8	Deep sediment	Potential deep areas of sediment deposits (e.g., 100 B/C Hole) where fish may be affected or areas of sediment accumulation upriver of the Yakima River confluence and downriver of the Walla Walla River confluence. Samples collected from the upper 10 cm of the sediment, in greater than 1.8 m of water.
Sediment cores	60	Shallow sediment cores	Potential areas containing sediments dating back to reactor operations including 100-B/C, 100-K, 100-N, and 100-D Reactor inlet structures, head of Lake Wallula pool (near the 300 Area), Yakima and Snake River deltas. Cores completed in sediment sequences that are generally thinner than 3 m thick.
	58	Deep sediment cores	Areas of thick sediment deposits dating back to reactor operations including Lake Wallula (Port Kelly, Hat Rock, just upriver from McNary Dam) and upriver of Bonneville Dam. Cores completed at water depths of up to 27 m with anticipated thick sediments sequences (greater than 3 m thick).

Medium	Quantity	Sample Type	Description
Island soils	90	Island soils (e.g., generally above the high water line)	Island soil that may have been transported during high river levels including Island 3, Locke Island, Homestead Island, Wooded Island, and Johnson Island. Island soils will be collected from the upper 15 cm of the riparian and upland zones of the islands.
Fish	120	Fish tissue	Sturgeon, bass, carp, sucker, walleye, whitefish (see also Table III)

[a] Minimum quantity; actuals will be determined from results of field surveys and screening.

Whitefish, sucker, walleye, carp, bass, and sturgeon will be sampled primarily to evaluate the potential human exposure via consumption. These fish species were selected because they were identified by Native Americans as being part of their diet and/or because they are popular sport fish in the investigation area. Data generated will also be used when possible to estimate potential health risks to the fish itself. Salmon were not selected because their migratory nature provides little opportunity for exposure to Hanford Site contaminants. Additional information on the fish sampling design is presented in Table III.

Table III. Fish Sampling Summary.

Target Fish Species	Preferred Habitat	Sampling Design	Tissues for Separate Analyses
Sturgeon	Shallow inshore slough areas evening, mid-river channel day; spawn in high velocity, rocky areas	Five samples per sub-area; one fish per sample	Fillets (muscle) with fatty tissue but without skin; Kidney and liver (combined); Carcass; Eggs (if available); Sediment or mussels in stomach (if present)
Carp	Shallow, vegetated areas, sloughs;	Five samples per sub-area; five fish per sample	Fillets (muscle) with skin; Kidney and liver (combined); Carcass
Suckers	Shoreline areas with aquatic vegetation	Five samples per sub-area; five fish per sample	Fillets (muscle) with skin; Kidney and liver (combined); Carcass
Walleye	Semi-turbid, low-velocity portions of the river	Five samples per sub-area; five fish per sample	Fillets (muscle) with skin; Kidney and liver (combined); Carcass
Whitefish	Low velocity areas of river - sand, gravel, or mud bottom	Five samples per sub-area; five fish per sample	Fillets (muscle) with skin; Kidney and liver (combined); Carcass
Smallmouth bass	Sloughs and backwaters, and low-velocity portions of river	Five samples per sub-area; five fish per sample	Fillets (muscle) with skin; Kidney and liver (combined); Carcass

BASELINE RISK ASSESSMENTS

Results from the new samples collected during the field investigation will be combined with existing data to conduct baseline human health and ecological risk assessments. The baseline risk assessments will help inform decision makers on whether or not there is a need for additional investigation or response actions under CERCLA. To the extent possible, the assessment design will consider the cumulative effects of both Hanford Site and non-Hanford Site contaminants. However, Hanford Site-related risks will be differentiated from those associated with non-Hanford Site constituents to determine the incremental risk from Hanford Site releases. The risk assessments will become a component of the RCBRA and will be performed in a manner that builds on, and is consistent with, the Source and Groundwater Component of the RCBRA [6].

Ecological Risk Assessment

In accordance with EPA guidance [9], the baseline ecological risk assessment will follow an eight-step process that begins with a preliminary screening of compounds and progresses incrementally to more detailed studies as needed. Based on the exposure pathways identified in the CSM, receptor groups for each habitat will be identified.

Assessment endpoints, which are the entity and the associated attributes to be protected, will be based on the receptor groups that are considered likely to have the greatest exposure to Hanford contaminated surface water and sediment. Measures of effect, which are the methods used to evaluate the potential for effect for each of the assessment endpoints, initially will be conservative, generic, media-specific ecological benchmarks. The endpoints and anticipated measures of effect for Steps 1 and 2 of the eight-step process are presented in Table IV.

Table IV. Preliminary Assessment Endpoints and Anticipated Measures of Effect.

Habitat Type	Assessment Endpoint	Measure of Effect
Aquatic habitat	Survival, growth, and reproduction of fish	Aquatic life water quality criteria and benchmarks
	Survival, growth, and reproduction of benthic organisms	Sediment benchmarks
Terrestrial habitat	Survival, growth, and reproduction of mammals	Wildlife-based soil benchmarks
	Survival, growth, and reproduction of birds	Wildlife-based soil benchmarks

These endpoints, which reflect general categories of receptors, are appropriate for the initial screenings of Steps 1 and 2. As part of the Step 3 analysis, the array of assessment endpoints will be expanded to be consistent with those used in the Source and Groundwater Component of the RCBRA, which assessed potential effects to the following receptor groups:

- Plants
- Soil invertebrates (potential endpoint)
- Benthic macroinvertebrates (both sediment and water exposures)
- Amphibians
- Fish
- Birds (insectivores, herbivores, omnivores, and carnivores)
- Mammals (herbivores, omnivores, carnivores).

These assessment endpoints will be evaluated as appropriate by comparing sample results to the studies from the source and groundwater component of the RCBRA. These studies are not compound specific, but evaluate the effects of Hanford Site-related contaminants in combination, as they exist in the source areas adjacent to the river. For this component of the Step 3 evaluation, the results of the ecological tests conducted as part of the RCBRA will be reviewed to estimate potential effects from similar compounds and similar concentrations detected in the rest of the river.

If needed, further ecological studies would likely be similar to those conducted for the source and groundwater component of the RCBRA (e.g., toxicity tests, bioaccumulation studies, tissue sampling). These studies would be preceded by a study-specific work plan outlining the goals and methods of the study. In accordance with the community involvement objectives for the project, regulator, Tribal, and stakeholder input will be obtained during the preparation of these and all other project documents.

Human Health Risk Assessment

The baseline human health risk assessment will focus on estimating health risks for the receptor groups most likely to have potential exposures to river media (sediment, surface water, pore water, island soils, and/or fin fish). In accordance with EPA guidance [10], risks will be evaluated over a range of exposure levels or intensities. The scenarios proposed for evaluation represent groups who will likely have the fullest range of exposures to the various media, from a casual/intermittent user of these resources to those anticipated to have the highest intensity/frequency of potential exposures (Table V). Residential exposure to surface water assuming potable water use and to dredged sediments from behind McNary Dam and placed in upland areas will also be evaluated.

Table V. Exposure Scenarios for Human Health Risk Assessment.

Receptor Group	Scenario Description
Native American	Local and regional Native Americans who have ties to the Hanford Reach of the Columbia River and surrounding lands
Avid angler	Adults and older children (older than age 6) that could potentially be exposed to contaminants through contact with surface water and sediments and consumption of fish from the river
Casual user	Adults or children who use the Columbia River for recreational purposes (e.g., swimming, boating, or participating in other activities along the river)

Results from the risk assessment will be coupled with information about uncertainties to identify estimated risks posed by Hanford Site-related contaminants of potential concern. The contaminants and the exposure pathways that are risk “drivers,” or those that have the greatest influence on the risk estimates, will be identified to assist in decision-making activities to determine whether or not any CERCLA cleanup actions are needed.

ROLE IN THE INTEGRATED CLEANUP STRATEGY FOR THE RIVER CORRIDOR

The results of this investigation are important to other Hanford Site cleanup activities in areas that border the Columbia River, also known as the “River Corridor.” In 1991, the Tri-Parties agreed to a “bias-for-action” approach to the CERCLA process for the Hanford Site. The agreement, known as the *Hanford Past-Practice Strategy* [11], streamlined the RI/FS process to begin remediation of contaminated waste sites earlier than typically performed under the traditional CERCLA process in place at that time. Source and groundwater cleanup actions at the 100 Area and 300 Area National Priorities List sites, a geographical area broadly referred to as the “River Corridor” began in 1994 and continue today. These cleanup actions were authorized via interim action Records of Decision (RODs) that were supported by qualitative risk assessments to establish a need for action.

The Tri-Parties have recently developed a strategy to pursue a transition from interim remedial actions to final remedial actions for the River Corridor source and groundwater operable units. The final RODs that are produced from this effort will establish the final remedial goals and objectives and any associated actions required to complete CERCLA cleanup for the River Corridor. Part of the strategy is to split the final cleanup decisions into smaller pieces of work that are more manageable and aligned with Hanford Site operational functions. Final remedy RODs will be developed for areas associated with the following:

- 100-B/C reactors
- 100-K reactors
- 100-N reactor
- 100-D and 100-H reactors
- 100-F reactor and Hanford townsite
- 300 Area fuel fabrication and development facilities.

Each of the six final remedy RODs will be integrated to address both source and groundwater remedial actions for the decision area. The impacts of the Hanford Site releases to the Columbia River are an integral piece of these final decisions. If any cleanup actions are needed to address Hanford Site contamination in the river, they may be included with the final decisions for one or more of the six areas. It is also possible that a separate cleanup decision could be made that is specific to the Columbia River. The objective for all of these decisions would be to protect human health and the environment.

PROJECT SCHEDULE AND WORK PROGRESS

The anticipated project schedule for the initial activities in this RI work plan (i.e., the field sampling, sample analysis, data evaluation) is depicted in Fig. 3. The field investigation and subsequent risk assessment activities will lead to a scientific/management decision point in 2011. It is at this scientific/management decision point that the Tri-Parties will identify the scope and begin the associated planning process for any further investigation activities that may be needed to continue the remedial investigation process. This decision point is also aligned to provide input to the RI/FS process being conducted to support each of the six final RODs. Draft RI/FS reports for each of the six decision areas are anticipated to be complete in 2011, with the first one to be delivered at the and of April 2011.

Sample collection and analysis activities supporting the remedial investigation were initiated in October 2008. Through the end of December 2008, the surface water sampling campaign has been completed and much of the shallow and deep sediment samples have been collected. Island soil and sediment core sample collection activities are anticipated to be performed during the first two quarters of 2009. Most of the fish collection activities are planned to occur during summer 2009. Groundwater upwelling surveys were initiated in December 2008 and will occur throughout 2009.

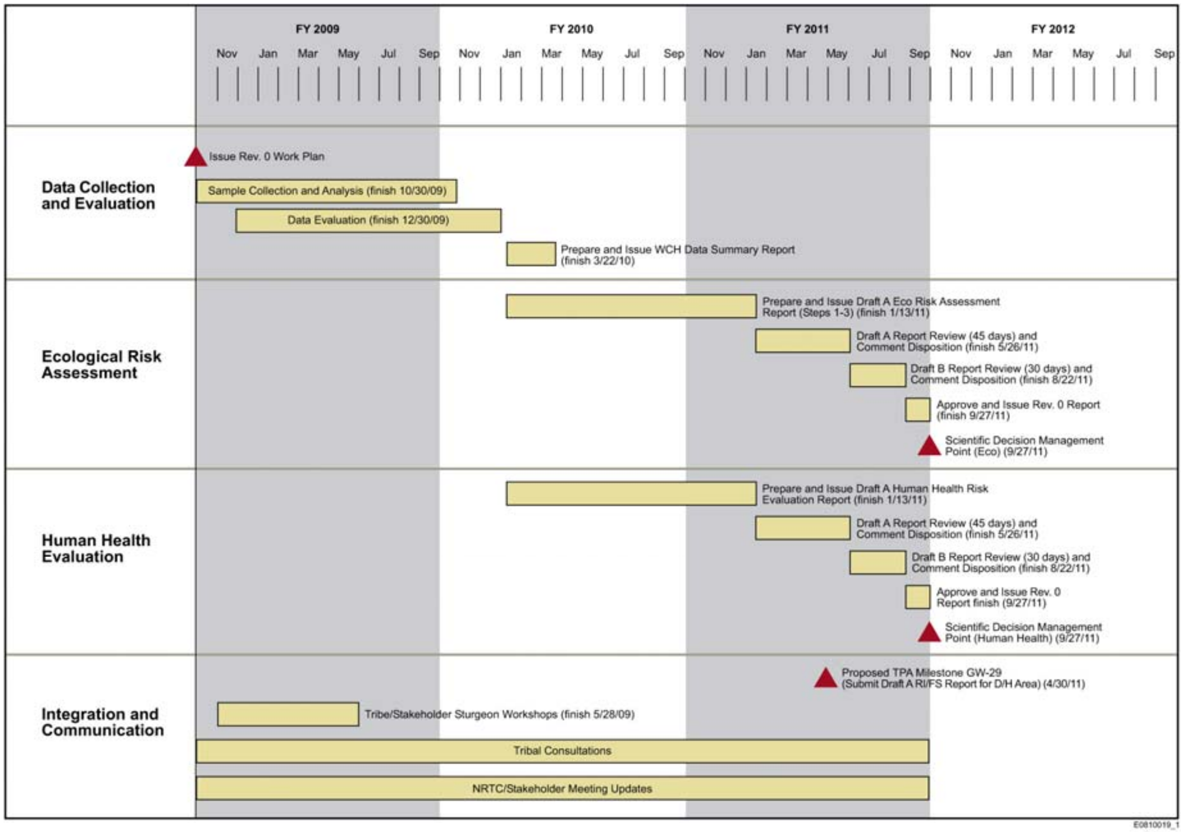

Fig. 3. Project Schedule.

COMMUNITY INVOLVEMENT

The *Community Relations Plan for the Hanford Federal Facility Agreement and Consent Order* [12] is the Hanford Site roadmap for public involvement under the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) [13]. The strategies outlined in the Community Relations Plan are designed to increase effectiveness and meaningful opportunities for interested parties to participate in key Hanford Site decisions.

Throughout the history of the project, DOE has recognized the benefits of having deliberate and ongoing communication with the regulatory agencies, Tribes, and stakeholders, particularly in the development of study and sample design and selection of risk characterization methodologies. A number of workshops and meetings were held throughout the remedial investigation scoping process to facilitate participation of interested parties, including state and federal agencies, natural resource trustees, Tribal members, site contractors, and the public. These workshops served as important forums for soliciting input and feedback for project objectives, study design, and resource protection. Meeting notes from the various workshops held between 2004 and 2008, as well as other reference documents, are provided on the Washington Closure Hanford (WCH) End State and Final Closure project library web site in the section entitled “Remedial Investigation of Hanford Site Releases to the Columbia River”: http://www.washingtonclosure.com/Projects/EndState/risk_library.html.
Updates to the schedule and general status of the work plan activities will be communicated to the regulators, stakeholders, and Tribes periodically during the performance of work. Unit managers meetings, Hanford Natural Resource Trustee Council meetings, Hanford Advisory Board meetings,

consultation with Tribal nations, and periodic workshops will be utilized to communicate work progress and schedule updates.

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