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APR 29 1997

Mr. Steve M. Alexander
Perimeter Areas Section Manager
Nuclear Waste Program
State of Washington
Department of Ecology
1315 W. Fourth Avenue
Kennewick, Washington 99336-6018

Mr. Douglas R. Sherwood
Hanford Project Manager
U.S. Environmental Protection Agency
712 Swift Boulevard, Suite 5
Richland, Washington 99352-0539

Dear Messrs. Alexander and Sherwood:

HANFORD FEDERAL FACILITY AGREEMENT AND CONSENT ORDER (TRI-PARTY AGREEMENT) INTERIM MILESTONE M-15-80A FOR COLUMBIA RIVER COMPREHENSIVE IMPACT ASSESSMENT (CRCIA)

Attached please find, the deliverable for the subject milestone (Attachment 1), due by April 30, 1997, which states "DOE is to provide a list of comprehensive work scope tasks developed and prioritized in coordination with the CRCIA Team (not based on funding)." The work scope represents requirements for a "comprehensive assessment" considered acceptable to the Tribal and stakeholder representatives to the CRCIA Team. The basis for the deliverable is Part II of the "Screening Assessment and Requirements for a Comprehensive Assessment: Columbia River Comprehensive Impact Assessment," (DOE/RL-96-16) which is being transmitted to you separately in fulfillment of Interim Milestone M-15-80.

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Attachment 1 consists of two parts: 1) a high-level sequence (flow-chart) of activities, and 2) a description of the sequenced activities and how they relate. The U.S. Department of Energy, Richland Operations Office (RL), has spent the last several months working with the CRCIA Team to identify the activities and sequence of the activities needed to fulfill the requirements for a comprehensive assessment (requirements were written by members of the CRCIA Team). Attachment 1 represents a summary-level, iterative version of this work; it incorporates comments provided by team members on its predecessor draft at the April 22, 1997, CRCIA Team meeting.

Also provided as Attachment 2, is a detailed outline (as it presently exists) developed in cooperation with the CRCIA Team; it was prepared as an interim step in producing the deliverable. The attachments and other information will be considered by RL in complying with Tri-Party Agreement Milestone M-15-80B (RL is to provide recommendations for CRCIA follow-on work), due July 31, 1997. RL plans to continue participation in CRCIA Team activities in preparation for meeting this and subsequent Tri-Party Agreement milestones.

The CRCIA Team supports the sequence of activities as the list of comprehensive work scope tasks for Milestone M-15-80A. Paraphrasing statements made by Team members, all the activities must be completed and are of equal priority across the breadth of the requirements. However, the depth to which those activities fulfill the requirements is negotiable.

If you want to discuss this matter further or require additional information, please contact Mr. Robert K. Stewart at 376-6192.

Sincerely,

Robert K. (Bob) Stewart

Robert K. Stewart, Project Manager
Groundwater Project

GWP:RKS

for George Sanders

George H. Sanders, Administrator
Hanford Tri-Party Agreement

Attachments: As stated

cc w/attachs:
L. Gadbois, EPA
D. Holland, Ecology
R. Morrison, FDH
M. Wilson, Ecology

cc w/o attachs:
R. Dirkes, PNNL
A. Knepp, BHI

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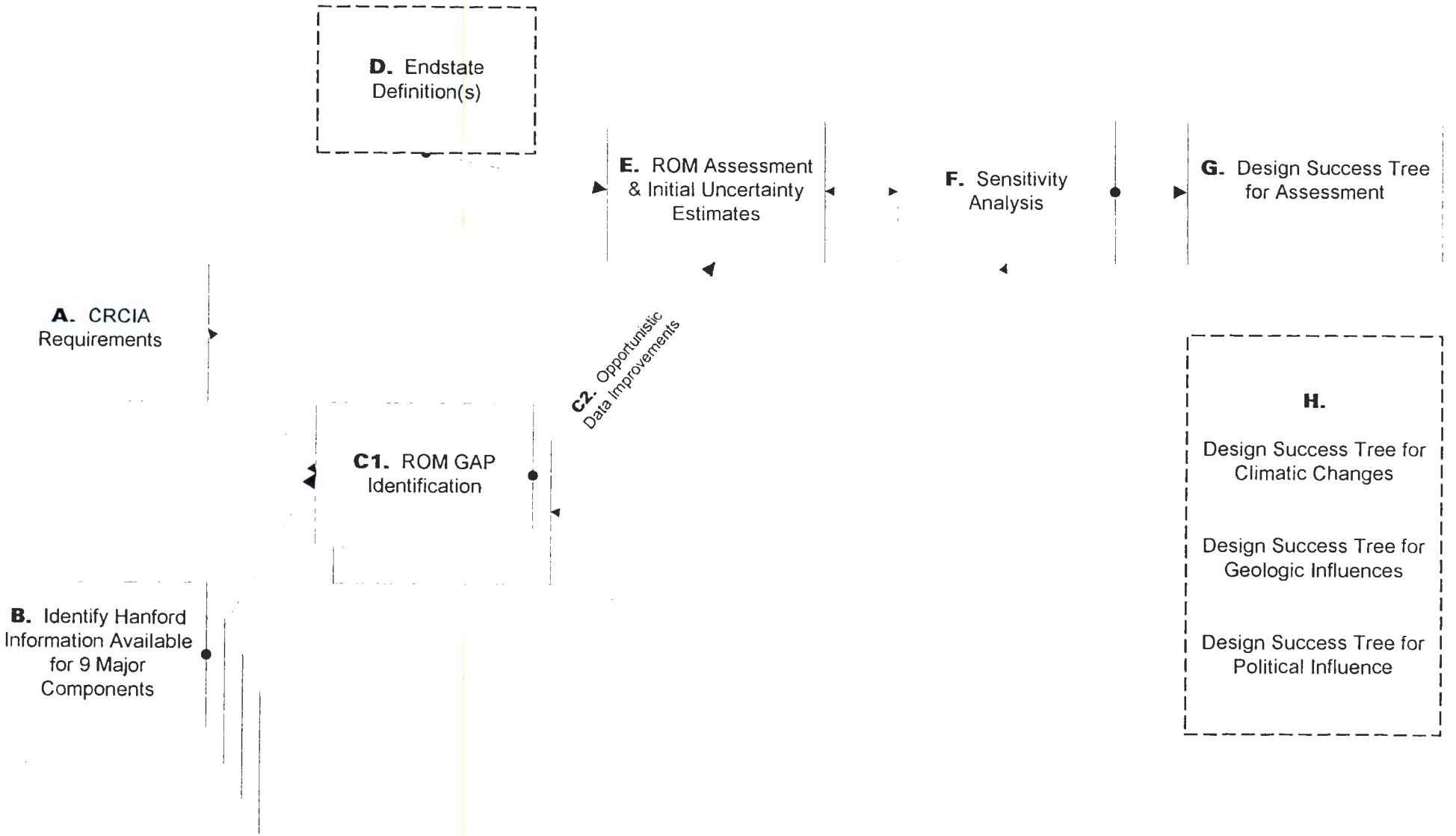
ATTACHMENT 1

SEQUENCE OF ASSESSMENT ACTIVITIES WITH DESCRIPTION

Figure 1. Sequence of Assessment Activities



Description of Sequenced CRCIA Activities

The purpose of the CRCIA is to assess the effects of Hanford-derived materials and contaminants on the Columbia River environment, river-dependent life and users of river resources.

For CRCIA to be comprehensive, representatives of the major community groups (CRCIA Team members who are other than the Tri-Party Agreement agencies) on the CRCIA Team have agreed that the following objectives must be achieved if the results and conclusions are to be acceptable by all concerned:

- Estimate with useful certainty, river-related human health, and ecological risks for the time period that the Hanford materials and contaminants remain intrinsically hazardous,

- Evaluate the sustainability of the river ecosystem, the interrelated cultural quality of life, and the viability of socio-economic entities for the time period that Hanford materials and contaminants remain intrinsically hazardous

- Provide results that are useful for decision making on Hanford waste management, environmental restoration, and remediation.

To do so, the following tasks must be completed (see Figure 1):

A. **CRCIA Requirements**. Complete detailed description of CRCIA Team requirements from the Requirements for a Comprehensive Assessment document. Detailed description must accurately portray CRCIA Team 's guidance on needs for a Comprehensive Impact Assessment.

B. **Identify Hanford Information Available for Nine Major Components**. The CRCIA Requirements document outlines nine major components instrumental to a complete and acceptable Comprehensive Assessment. This step involves compiling the information known about these nine areas from the CRCIA Screening Assessment and other Hanford documents. The nine major components are: (1) Hanford Materials and Contaminants (Sources and Inventories), (2) Containment Failure and Release Mechanisms, (3) Transport Mechanisms and Pathways to the Columbia River, (4) Contaminant Entry into the Columbia River, (5) Fate and Transport of Columbia River-borne Contaminants, (6) Critical Habitat and Uptake Locations, (7) Receptors and Exposure Pathways, (8) Dose Assessment, and (9) Receptor Impact and Tolerance Assessment.

C1. **Rough Order of Magnitude (ROM) GAP Identification**. Analyze the information compiled for each of the nine components, Step B, to determine if existing Hanford documents satisfactorily meet the CRCIA requirements. Also, identify additional data needed for any of the nine components to complete a ROM assessment.

C2. **Opportunistic Data Improvements**. Based on the ROM GAP Identification, acquire the minimum supplemental information needed to complete a ROM assessment

and allow the opportunity for newly acquired information to be incorporated into the ROM assessment.

D. **Endstate Definition(s)**. Define known and probable endstates for the Hanford Site taken from existing DOE and Tri-Party Agreement documents. Establish a "base case" definition for use in the ROM assessment.

E. **ROM Assessment and Initial Uncertainty Estimates**. Complete a Rough Order of Magnitude (ROM) Assessment for the endstate(s) defined. The ROM assessment must incorporate the nine components using the existing information and that compiled through the previous steps. The ROM assessment will be done using existing calculation models. At this time an initial estimate of the uncertainty for each of the nine components the assessment process would be also be provided.

F. **Sensitivity Analyses**. Conduct sensitivity analyses to determine which components in the ROM Assessment are most influential for each endstate definition. The sensitivity analyses will help define what information is needed to decrease the uncertainty levels identified in Step E. An understanding of the most influential assessment components, then allows for an refined estimate of the uncertainty for the assessment process and each of the nine components.

G. **Design Success Tree for Comprehensive Assessment**. Analyze the ROM assessment and sensitivity analyses results to determine what are the most important contributors to contamination impact for this assessment. Then identifying what the information and data needs are for a successful comprehensive assessment. Aspects of this step could include such activities as refining the Requirements, designing the assessment project, and determining how to fill data gaps (i.e. document searches, field work, laboratory analyses, research and development, etc.).

H. **Design Success Tree for Climatic Changes, Geological Changes and Political Influences**. Define probable climatic, geologic and political influences to determine which of the nine components are affected so an assessment can be run to determine if the endstate is protective of the Columbia River with these influences.

This process is iterative in that many of the steps will be repeated and refined, possibly many times, before the Comprehensive Assessment is completed. Project administration and control tasks must continue throughout the life of the project.

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ATTACHMENT 2

DRAFT DETAILED OUTLINE WITH DEFINITION STATEMENTS

Draft Detailed Outline with Definition Statements

Columbia River Comprehensive Impact Assessment (CRCIA)

A comprehensive impact assessment has been designed by a team. Those listed in bold are currently active members of the team. The CRCIA team seeks to include representation from the following groups:

- **General citizenry affected by Hanford**
- Persons who use the Columbia River for sustenance, commerce or **recreation**
- **Affected Tribal governments**
- **Tri-Party Agreement agencies**
- **Federal and State regulators of Hanford**
- Federal, State, and local public health agencies
- Hanford Natural Resource Trustee Council
- Fish and wildlife agencies, state
- Representatives of the affected local, **state, and federal governments**
- Others associated with river-related scenarios

The CRCIA is to assess the effects of Hanford-derived materials and contaminants on the Columbia River environment, river-dependent life and users of river resources. In doing so, an effectiveness measure for waste disposal plans at the Hanford Site is created. Three broad objectives exist for the assessment. It is meant to:

1. Estimate with useful certainty, river-related human health and ecological risks for the time period that the Hanford materials and contaminants remain intrinsically hazardous,
2. Evaluate the sustainability of the river ecosystem, the interrelated cultural quality-of-life, and the visibility of socio-economic entities for the time period that Hanford materials and contaminants remain intrinsically hazardous, and
3. Provide results that are useful for decision-making on Hanford waste management, environmental remediation, and restoration.

In general, the CRCIA is an assessment which measures the effect of Hanford contaminants on the sustainability of the Columbia River ecosystem and its cultures from Priest Rapids Dam to its mouth near Astoria.

A goal of three years to produce the first assessment has been presented during the meetings. This timeframe is to be an assumption of the initial estimates of time and effort.

1 *Develop Assessment Tools*

A class of requirements are needed to establish study sets for each component and to balance and assure minimum overall uncertainty for the resources invested. This includes identifying software or data requirements imposed to assure that developed tools possess adequate performance to reach eventual uncertainty allocations for the "produce assessment results" phase. Tool scope includes the size requirement in each tool for every set contained in the study set, the River scenarios, and disposal methods required, all scenario variables required, and.....

This function is the development of all computational tools and data (e.g. ecosystem information, biological effects parameters) needed to assess impacts on the River over the full range of River scenarios required, as well as over the anticipated Hanford Disposal Baseline. It is to provide all needed statistical definition and calculation tools. A possible deliverable from this activity is a revision to the current Hanford Site Risk Assessment Methodology.

It is important to recognize that this aspect of the project will ultimately be designed by the TDI Team, with sensitivity to CRCIA objectives. Therefore, details listed in this section are quite subject to change.

1 *Represent Hanford Materials and Contaminants*
- 1 Select Appropriate Technical Experts to Perform the Work
- 2 Construct Candidate Set of Data
  - 1 Review Information from Current Site-Wide Data Set(s)
    - 1 94-2 Composite Analysis (rad only)
    - 2 Site Systems
    - 3 HEIS (data collected since ???)
    - 4 Classified documents
    - 5 Others (Siemens, WPPSS, US Ecology, Kaiser Aluminum)
  - 2 Identify Data Gaps
    - 1 Correlate Other Studies to CRCIA Needs
    - 2 Evaluate Quality of the Data
  - 3 Fill Data Gaps
  - 4 Identify Research and Development
- 3 Propose Study Set of Contaminants
  - 4 Sensitivity Uncertainty Analysis for Evaluation of Contaminant/Cost Tradeoff
  - 5 Sensitivity Uncertainty Analysis for Evaluation of Contaminant/Cost Tradeoff for Evaluation of Contaminant/Fidelity Tradeoff
    - 1 Individual Contaminants
    - 2 Mass Balances
    - 3 Chemical Groupings
- 4 Map Source Term Elements

2 Represent Candidate Set of Containment Failure & Release Scenarios
- 1 Select Appropriate Technical Experts to Perform the Work
- 2 Review of Containment Failure Scenarios in USDOE disposal engineering plans (see PNL-4688 "Assessment of Single-Shell Tank Residual Liquid Issues at Hanford Site, Washington for an example of considering leaking of all SSTs)
  - 1 Type of Containment
    - 1 Tanks with Waste

2 Tanks without waste but with contamination
3 Drums with solid waste
4 Burial boxes with solid waste
5 Direct buried submarine reactor compartments
6 Cribs, ditches & ponds
7 Graphite reactor cores in buildings or buried
8 Transportation casks
9 Others

2 Failure Modes of Containment
1 Corrosion
2 Seismic
3 Excavation
4 Transportation Accidents
1 Boats
2 Trains
3 Trucks
5 Other

3 Probability of A Failure Mode Occurring
1 Expected time when containment would be breached
2 Containment Durability

3 Refine Candidate Set to Study Set
4 Perform sensitivity analysis & uncertainty analysis
5 Propose Study Set

3 *Represent Transport Mechanisms & Pathways to the Columbia River*: vadose and groundwater pathways from initial material and contaminant inventories to the river.
1 Select Appropriate Technical Experts to Perform the Work
2 Candidate Set of Pathways
1 Leaching through vadose zone to groundwater and to the river
1 Review vadose zone characterization efforts in projects
1 Integrate with TWRS Expert Panel
2 Review of transport modeling data projects
2 Upland biotic transport to the river –i.e. tumbleweeds
1 Review of Environmental monitoring project data
3 Aerial Transport
1 Review of NESHAPS unusual occurrences, etc.
3 Identify Data Gaps
4 Correlate Other Studies to CRCIA Needs
5 Evaluate Quality of the Data
1 There is a current DQO activity for the groundwater monitoring data
4 Fill Data Gaps
1 Identify Research and Development
5 Refine Candidate Set to Study Set
6 Perform sensitivity analysis & uncertainty analysis
7 Propose Study Set

4 Represent Study Set of Contaminant Entry Into the River
1 Select Appropriate Technical Experts to Perform the Work
2 Candidate Set of Contaminant Entry Pathways
1 Effluent outfall
1 Establish Candidate Set of Pathways

1 Review unusual occurrences and FEMPS data,
2 Perform Sensitivity & Uncertainty Analysis as needed
3 Fill any Data Gaps
4 Propose Study Set

2 Aerial deposition
1 Establish Candidate Set of Pathways
1 Review NESHAPS and DOE 5820.2A data
2 Perform Sensitivity & Uncertainty Analysis as needed
3 Fill any Data Gaps
4 Propose Study Set

3 Springs at the river
1 Establish Candidate Set of Pathways
1 Below the water table
2 Above water table
2 Review Existing Information
3 Correlate to CRCIA
1 Identify Data Gaps
4 Fill any Data Gaps
1 Research & Development
5 Propose Study Set
1 Perform Sensitivity & Uncertainty Analysis as needed

4 Biotic entry to the river
1 Establish Candidate Set of Biotic Ranges which overlap with the River
1 Review of Environmental monitoring and Other project data for Ranges which overlap with the River
2 Determine Entry of Contaminated biota
1 tumbleweeds
2 mammals (mice)
3 birds (i.e. pigeons and their droppings)
4 insects (ants)
5 others

3 Identify Data Gaps
1 Correlate Other Studies to CRCIA Needs
1 TPA Milestone studies and documents
2 Evaluate Quality of the Data

4 Fill Data Gaps
1 Research and Development
1 Support Mapping the Aerial Extent of the Riverbed Affected by Contaminants
2 Comparable Baseline Mapping

5 Refine Candidate Set to Study Set
1 Perform sensitivity analysis & uncertainty analysis

6 Propose Study Set

5 *Represent Fate & Transport of Contaminants in the Columbia River*: contaminant distribution in the River in appropriate chemical phases after the contaminants have been moved away from their point of entry.
1 Select Appropriate Technical Experts to Perform the Work
2 Construct Candidate Set of Fate & Transport Data: Describe contaminant mixing in the river

1 Understand potential changes in contaminant chemistry
2 Identify major locations of river sediment distribution
3 Describe reconcentration pathways
4 Irrigation effects
5 Biotic accumulation
6 Collection on equipment

3 Review Information from Current Sources
1 Oregon Department of Environmental Quality
2 Washington Department of Health
3 US Army Corps of Engineers
4 Bi-State Columbia River Study
5 Others

4 Identify Data Gaps
1 Correlate Other Studies to CRCIA Needs
2 Evaluate Quality of the Data

5 Fill Data Gaps
1 Identify Research and Development
1 Improved Sediment Profile
2 Targeted Sampling for Where Contaminants are Accumulating

6 Propose Study Set of Information

7 Perform sensitivity analysis & uncertainty analysis

6 Represent Study Set of Habitat & Contaminant Uptake Locations
1 Select Appropriate Technical Experts to Perform the Work
2 Candidate River Habitat Sets
1 Historic River Ecology
1 River Watershed
1 Upland Areas
2 Riparian Zone
3 Free-Flowing Sections of the River
4 Tide Pools
5 The River-Bottom
2 Current River Ecology
1 Watershed
1 Upland Areas
2 Riparian Zone
3 Free Flowing River
4 Tide Pools
5 River-Bottom

3 Review Information from Current Sources which Already Identify Critical Habitats
1 Threatened and Endangered Species Information
2 Commercially Important Species
3 Recreational Areas
4 Aesthetically Used Areas

4 Identify Data Gaps
1 Correlate Other Studies to CRCIA Needs
2 Evaluate Quality of the Data

5 Fill Data Gaps
1 Research and Development
1 Improved Trophic Level Information
2 Frequency of Habitat Use
3 Prominence

4 Community Role

6 Propose Study Set of Information

7 Perform Sensitivity and Uncertainty Analysis

8 Cross-Reference Contaminant Transport to the River with Habitats to Identify Dominant Contaminant Uptake Locations/Mechanisms

1 Perform Sensitivity and Uncertainty Analysis

2 Propose Study Set

7 Represent Receptors

1 Select Appropriate Technical Experts to Perform the Work

2 Construct Candidate Set of River-Related Receptors

1 The River Environment

Is this different than Habitats???

2 Users of the River Environment

1 Food Chain/Sustenance Webs

1 Human Webs

1 Fishing

2 Upland game

3 Waterfowl

4 Agriculture

2 Other Webs (perhaps most easily captured by habitat)

1 Water column

2 Benthic organisms

3 Riparian

4 Upland

2 Economic Networks

1 River Transportation

2 Recreation/Tourism

1 Sport fishing

2 Sport hunting

1 Waterfowl

2 Upland game

3 Windsurfing

4 Boating

5 Swimming

6 Birdwatching

3 Agricultural

4 Other River Industries

1 Aluminum Plant

2 Paper Mills

3 Coal Power Plant

3 Cultural Webs

1 Aesthetics

2 Sacredness

3 Propose Dominant Components of Each Web as the Study Set of Receptors

4 Sensitivity analysis

5 Uncertainty analysis

8 Represent Exposure Pathways: Interfaces between Study Set of Habitat Uptake Locations & Study Set of Receptors

9 Represent Dose Assessment:
- 1 Select Appropriate Technical Experts to Perform the Work
- 2 Measures
  - 1 Health Effects
    - 1 Cancer effects
    - 2 Other
  - 2 Mutagenic Effects
    - 1 Teratogenic Effects
  - 3 Biodiversity
    - 1 Maximizing the number and type of species in area for stability of the interrelated systems
  - 4 Avoidance Behaviors
    - 1 Choosing not to consume local products
    - 2 Avoidance of contaminated areas
    - 3 Migration or Relocation Away
  - 5 Lack of Opportunity for Use
    - 1 Fishing
      - 1 Seasonal
      - 2 Year-round
    - 2 Foraging
    - 3 Hunting
    - 4 Birdwatching
- 3 Attributes
- 4 Relate to Exposure
  - 6 Epidemiology Studies?

10 Represent Receptor Impact and Tolerance
- 1 Select Appropriate Technical Experts to Perform the Work
- 2 Represent Impacts to Study Set of Scenarios
  - 1 Ecosystem Integrity
  - 2 Economic Networks
  - 3 Cultural Aspects
    - 1 Impacts to small gene pools
- 3 Represent Tolerances of those Impacts
  - 4 Sensitivity analysis
    - 1 Sensitive Populations
  - 5 Uncertainty analysis

11 Represent Columbia River Climate, Geological & Political Alternatives
- 1 Select Appropriate Technical Experts to Perform the Work
- 2 Columbia River Climate
  - 1 Ice cap melting (i.e. global warming)
- 3 Geological
  - 2 Loss of a Dam
  - 3 1000 year flood
  - 4 Dredging
    - 1 Upland spoils
- 4 Political

12 Mechanize the Representations
- 1 Select the Software Approach
- 2 Obtain the Software
- 3 Verify & Validate Tools

4 Obtain New Data
5 Peer Review

13 Perform Stochastic Characterization
1 Identify Sources of Uncertainty
2 Represent Exposure Process in Probabilistic Manner
3 Characterize the Analysis Uncertainties
1 Quantify Model Uncertainties
2 Quantify Parameter Uncertainties
3 Integrate Representation Uncertainty

Produce Assessment Results

A verified, published report of River impact assessment results for all River scenarios given the current Hanford Disposal Baseline is to be provided from this activity. It should be a relatively straight-forward stage of the project, given the earlier planning steps in the project have been completed. It is the activity of producing impacts from the Hanford materials and contaminants on the Columbia River environment and cultures. The CRCIA team has explicitly stated certain sensitivities which the assessment must include. Those sensitivities for which receptor impact and tolerance must be measured are:

Ecosystem Integrity
Economic Networks
Cultural Webs

with consideration of influences due to changes in the Columbia River climate, geology and politics.

1 *Prepare Input Data*: i.e. assemble & process input data
2 Evaluate
1 *Calculate*: mathematically estimate the assessment results
2 Qualitatively Evaluate
3 Verify & Validate Results
4 Publish Results

Assessment Use & Feedback

Get feedback from reviewers. Revise the report. Distribute the report to all *affected* parties. Inform affected parties about report implications.

1 Determine information requirements for decision-makers: This is the activity of defining what information is useable. It is the information needs of all parties to any decisions; it includes all stakeholders.
2 Distribute draft reports to all *interested* parties.
3 Get feedback from reviewers.
4 Revise the report.
5 Distribute final reports and inform affected parties about report implications.

Decision-Makers likely to use information from the CRCIA include:

- Affected Parties
- Bonneville Power Administration
- Local City & County Governments
- Federal
  - US Army Corps of Engineers
  - US Bureau of Land Management
  - US Bureau of Reclamation
  - US Congress
  - US Department of Energy
  - US Forest Service
  - US Department of Interior
  - US Environmental Protection Agency
  - US Fish & Wildlife
- General Public
- International Fisheries Organizations
- Oregon State
  - Department of Environmental Quality
  - Department of Health
  - Department of Wildlife & Aquatics
- Tribal Governments
  - Confederated Tribes of the Umatilla Indian Reservation
  - Nez Perce
  - Yakama Indian Nation
- The Nature Conservancy
- Washington State
  - Department of Ecology
  - Department of Health
  - Department of Natural Resources