Meeting Minutes
Columbia River Comprehensive Impact Assessment
Weekly Management Meeting
May 7, 1996
ETB Building, Columbia River Room, 1:00 - 2:30

Attendees(*)/Distribution(#):

Charlie Brandt, PNNL#
Amoret Bunn, Dames & Moore@*#
Sandra Cannon, PNNL*#
Paul Danielson, NPT*#
Greg deBruler, HAB#
Kevin Clarke, RL#
Roger Dirkes, PNNL*#
Sue Finch, PNNL@*#
Larry Gadbois, EPA#
Stuart Harris, CTUIR*#
RD Hildebrand, RL*#
Dave Holland, Ecology*#
A Knepp, BHI#
Jay McConnaughey, WDFW#
Terri Miley, PNNL#
Dick Moos, BHI#
Nancy Myers, BHI*#
Bruce Napier, PNNL#
Lino G. Niccoli, YIN*#
Roger Ovink, BHI#
Doug Palenshus, Ecology*#
Ralph Patt, Oregon*#
Stan Sobczyk, NPT*#
Bob Stewart, RL#
Mike Thompson, RL*#
JR Wilkinson, CTUIR#
Thomas W. Woods, YIN#
Jerry Yokel, Ecology#
Admin Records-CRCIA#

Summary of Discussions:

In Bob Stewart's absence, Dave Holland ran the meeting.

Hanford Update Article

This agenda item was deferred to the following week. Comments have been received and the public outreach team will consolidate/incorporate the comments at the 5/8/96 weekly outreach meeting. An updated article will be faxed out to the team for review. The due date for submission of the article is May 15. Nancy Myers was assigned an action to determine if the date could be extended. If the date cannot be extended, the article will be submitted based on comments received and a final version handed out at the May 14 meeting.

Proposal for Public Outreach Team

This agenda item was deferred to the following week.

Preface Discussion

The attached preface was handed out to team members. The goal of today's discussion was to reach agreement and finalize the preface. The deadline for finalizing the preface for including an updated version in the data report is May 15, 1996. The preface has not been edited. It is first necessary to reach agreement on key words and concepts, then follow with an edit. Comments that have been received and incorporated are noted by the redlined (shaded) text following each paragraph. Two team members have provided written comments that conflict with each other's comments. This discussion will be on next week's agenda with agreement required at the meeting. If agreement is not reached, an earlier version of the preface will need to be used in the data report.

Schedule for Comment Resolution on Species Report

A meeting has been scheduled for Thursday, May 30, for PNNL staff to present to DOE, EPA, and

Ecology proposed responses on the comments received. Team members are welcome to attend this first session if interested. A second meeting to present proposed responses to the CRCIA team is schedule for June 4.

Other Items not on the Agenda

Copies of the "Compilation of Comments on Human Scenarios for the Screening Assessment: Columbia River Comprehensive Impact Assessment" were handed out to team members and are attached to the minutes.

The subject of meeting minutes and the need for a summary of agreements reached to date was raised. An action was assigned to Sue Finch to prepare a summary of agreements reached to date. It was also noted that it would be helpful to have specific decisions or agreements that need to be reached noted on the agendas.

Comprehensive Chapter:

- None identified at this meeting.

Agreements:

- None identified at this meeting

Action Items:

Action Description	Assigned To	Due Date
Determine if the due date of May 15 for the Hanford Update Article can be extended	Nancy Myers	ASAP
Prepare summary of agreements reached to date..	Sue Finch	ASAP

Attachments:

- 5/7/96 meeting agenda
- Preface
- Compilation of Comments on Human Scenarios for the Screening Assessment: Columbia River Comprehensive Impact Assessment

Prepared by SM Finch on 5/13/96

AGENDA
Columbia River Comprehensive Impact Assessment
Weekly Project Management Team

Scheduled from 9:00 - 12:00 p.m., May 7, 1996
Bechtel Building, 3350 George Washington Way, 2A01 Conference Room

Scheduled from 1:00 - 4:00, May 7, 1996
Battelle's ETB Building, Columbia River Room

Morning Session

1. 9:00 - Comprehensive Section
   - Thomas Woods - Introduction
   - Paul Danielson - Waste Entry to River Requirements
   - Thomas Woods - River Hydrodynamics Requirements

Afternoon Session

1. 1:00 - Bob Stewart - Introduction

2. 1:15 - Amoret Bunn - Hanford Update Article
   - A draft article announcing the publication of the Data Report in June was handed out at the 4/30/96 meeting for team review. All comments received by COB Monday, 5/6/96, will be incorporated and a final version handed out at the 5/7/96 meeting.

3. 1:45 - Rose Bennett - Proposal for Public Outreach Team
   - At the 4/23/96 meeting, a proposal for the Public Outreach Team was handed out and discussed. The proposal was briefly discussed at the 4/30/96 meeting. An updated proposal will be presented to the team for agreement at the 5/7/96 meeting.

4. 2:15 - Sandra Cannon - Continue Preface Discussion
   - Comments received by COB 5/6/96 will be incorporated and presented to the team at the 5/7/96. The goal is to reach agreement and finalize the preface at the 5/7/96 meeting.
   - Team members are requested to bring samples of maps that contain information/layout, etc, they would like to see in the up-front project map

5. 3:15 - Roger Dirkes - Schedule for Comment Resolution on Species Report

6. 3:30 - Review of Upcoming Meetings

   5/14/96 - Morning - Bechtel Building, Room 1B02 [NOTE Room Change]
   - Dan Landeen/Larry Gadbois - Habitat & Critical Locations Requirements
   - Dan Landeen/Larry Gadbois - Receptor Exposure Pathways Requirements

   5/14/96 - Afternoon -Bechtel Building, Room 1B02 [NOTE Room Change]
   - Rick Blancq - CRCIA Internet - briefing and demonstration
   - Dick Gilbert - Introduction of Jerry Sacks
   - Terri Miley - Presentation of map with segments/data points
   - Bruce Napier - Hand out copies of responses to comments on the Contaminants Report

   5/21/96 - Morning - Bechtel Building, Room 2A01
   - Dan Landeen/Stuart Harris - Dose-to Receptor Calculation Requirements

   5/21/96 - Afternoon -ETB Columbia River Room
   - Bruce Napier - Present proposed responses on the Scenarios Report comments

Preface
[May 7, 1996]

[sdc note: DO NOT spend time on editorial nit picking; transitions that create a logical flow of thought will be written once the CRCIA Team has agreed on the key components; needed NOW is agreement on KEY words and concepts.]

The Columbia River is critical to the Pacific Northwest for drinking water, ecological habitat, fish, industry, irrigation, recreation, transportation, and cultural quality of life. Because of past nuclear production operations at the Hanford Site which borders the Columbia River, because of the close proximity of the river to the chemical and radioactive materials being stored at the Hanford Site, and because rainfall[?] and groundwater eventually may carry the contaminants to the river, an assessment is needed to estimate the present and future risks to the Columbia River from Hanford-derived contaminants.**[Proposed by Tom Woods 4/16/96, fine tuned by sdc; Woods warns about accurate use of "contaminant"]**

OR

The Columbia River is a treasured resource to residents of the Pacific Northwest. It provides for basic needs and is intertwined with the life style and quality of life for Columbia Basin's many human and non-human residents. This resource drew the Manhattan Project's planners to the site now called Hanford ~~in order~~ to produce nuclear weapon materials. Production of those materials has left behind a legacy of chemical and radioactive contamination and materials that have, are, and will continue to pose a threat to the Columbia River for the foreseeable future. This [report] documents a screening assessment of the current contaminant conditions in the Columbia River and provides guidance for more comprehensive efforts and ~~guidance for a~~ river- sensitive planning of the Hanford Site cleanup.**[Proposed by Larry Gadbois 4/25/96; editorials recommended by sdc]**

Background

The Hanford Site is located on land ceded in 1855 by treaties with the Yakama Indian Nation and the Confederated Tribes of the Umatilla Indian Reservation. The Nez Perce Tribe has treaty rights on the Columbia River. The tribes were guaranteed the right to fish at all usual and accustomed places and the privilege to hunt, gather roots and berries, and pasture horses and cattle on open and unclaimed land.**[Summary of 1994 Env. Mon. report; inclusion recommended by sdc; need lead in to next paragraph]**

From 1944-1987, the U.S. Department of Energy (DOE) conducted nuclear production operations at the Hanford Site along the Hanford Reach of the Columbia River (see Figure P.1 [SG96030040.1]). The Hanford Reach extends 85 kilometers (51 miles) downstream from Priest Rapids Dam to the head of the McNary Pool near the city of Richland, Washington. These past nuclear operations resulted in the release of hazardous chemicals and radionuclides] to the Columbia River. Whereas during the period of operation contaminant releases were direct to the river, most of today's concerns are caused by past disposal of contaminated waste[?] on land. Current conditions of the Columbia River reflect that contamination is reaching the river primarily via the groundwater pathway. Seeps, an extension of groundwater flow, and biota also contribute to the Hanford-origin contamination present in the river. **[4/30/96 Tom Woods concerned with use of "waste" because plutonium is not classified as waste.]**

Presently, two-thirds of the nation's defense nuclear waste is at the Hanford Site [reference needed] with continuing shipments of nuclear waste being received. The preponderance of this nuclear waste will remain at the Hanford Site. Truly permanent isolation of wastes is extremely difficult to achieve. Now or several thousand years from now (depending on the performance of the chosen isolation solution), the chemical and nuclear wastes at the Hanford Site will reach the Columbia River.**[Proposed by Tom Woods 4/16/96, fine tuned by sdc; 4/25/96 Larry Gadbois says it will not all reach the river because most of the material will be detained long enough to decay to non-contamination...]**

As a result, four areas of the Hanford Site (the 100, 200, 300, and 1100 Areas) have been placed by the U.S. Environmental Protection Agency (EPA) on the national priorities list for cleanup. The national priorities list is a component of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) (42 USC 9601) enacted by the U.S. Congress.[No change recommendations received as of 4/19/96]

The cleanup of the Hanford Site is a joint activity of three government agencies: DOE, EPA, and the Washington State Department of Ecology. These Tri-Party agencies have signed an agreement known officially as the *Hanford Federal Facility Agreement and Consent Order* and unofficially as the Tri-Party Agreement (Ecology et al. 1994). Milestones have been adopted for the Tri-Party Agreement that identify actions needed to ensure acceptable progress toward Hanford Site compliance with CERCLA, the *Resource Conservation and Recovery Act of 1976* (42 USC 6901), and the *Washington State Hazardous Waste Management Act* (RCW 1985).[4/25/96 Larry Gadbois questions first sentence; sdc feels the Tri-Party agencies should be defined; rewording of 1st sentence with "is the responsibility" or some such might resolve Larry's concerns]

During 1993, the Tri-Party agencies began work toward a comprehensive assessment of the impact of past nuclear operations on the current conditions of the Columbia River (DOE 1994). In January 1994, a revision to the Tri-Party Agreement (Change Order number M-13-93-06) adjusted the milestones. This change order included a new Milestone, M-15-80 (formerly M-13-80b), that established the Columbia River Comprehensive Impact Assessment (CRCIA). In December 1995, a follow-on change order (M-15-95-09) modified the milestone, enhancing the review process and specifying target dates.[4/25/96 Larry Gadbois feels the above is too legal; however, sdc feels there are readers for whom the above is important and so recommends retaining because it documents how CRCIA came about.]

Because the scope and priorities of CRCIA have been controversial, the Columbia River Comprehensive Impact Assessment Management Team (CRCIA Team) was formed in August 1995 to advise the Tri-Party agencies. The CRCIA Team meets weekly to share information and provide input to decisions made by the Tri-Party agencies concerning CRCIA. Representatives from the Confederated Tribes of the Umatilla Indian Reservation, Hanford Advisory Board, Nez Perce Tribe, Oregon State Department of Energy, and Yakama Indian Nation have been active participants on the team.
[January 11, 1996 by the CRCIA Team for publication in the Department of Ecology's Fact Sheet; 4/30/96 CRCIA Team agreed to cut list of specific goals for team.]

Purpose

In light of the Hanford Site's past, present, and future handling and [?] storage of hazardous materials and the resulting need to protect the Columbia River ~~from future contaminants~~, the purpose of CRCIA is to assess the potential effect of Hanford-derived contaminants on the Columbia River environment and its users. To achieve this purpose, CRCIA needs to:

- estimate the river-related risks to human health, the sustainability of the ecosystem, economic vitality, and cultural quality of life, which result from hazardous materials originating at the Hanford Site throughout the time those materials remain intrinsically hazardous

- establish the requirements under which this and future analyses would necessarily be conducted if their results and conclusions are to be regarded as acceptably comprehensive

- provide results for use in Hanford cleanup decisions

[Worked on by the CRCIA Team 4/16/96; 4/25/96 Larry Gadbois recommended changes
- "sustainability of ecosystem" does not contain important concept that if system is degraded we want that system to recover - change to "ecological integrity"?
- amend with the idea of being comprehensive relative to protection of the river
- identify near-term IRMs [write out] needed to protect the Columbia River from contaminants currently in the river]

Approach

CRCIA is a multi-phase analytical effort. Initially, only the current state of the river is being explored in a screening assessment. The results of the screening assessment (Part I of this report)[delete parenthetical info from Data report] may indicate additional work is necessary to conclusively define the river's current state. OR The results of the screening assessment (Part I of this report)[delete parenthetical info from Data report] is designed to identify the need for near-term IRM [spell out] action to protect the river and its users. [5/2/96 Dave Holland] Simultaneously with the screening assessment, the requirements for completing a comprehensive assessment (Part II of this report)[delete parenthetical info from Data report] are being defined. Subsequent phases will be defined and recommended for funding as an integral part of a later definition effort. [Proposed by Tom Woods 4/16/96, fine tuned by sdc; 5/2/96 Dave Holland feels approach needs to be simplified which will be done once we agree on key words and concepts]

The objectives of the FY1996 work are:[To remain for Data Report; to be moved to introduction of Part I for the compilation report] **[5/2/96 Dave Holland questions need for listing these objectives; he recommends just listing 1 and 4 and deleting nos. 1, 2, and 5]**

1. Perform an assessment of contaminants derived from the Hanford Site (existing conditions including residual contaminants from past operations) in a screening assessment of risk to support the Interim Remedial Measures decisions

~~2. Compile and make available to the public the approximately 2000 documents identified in Appendix A of the data compendium (Eslinger et al. 1994); pertinent supporting Hanford Site data will be made available~~

~~3. Work with the declassification efforts of the Hanford Advisory Board to identify the Columbia River documents as a high priority for release~~

4. Define the essential work remaining to provide an acceptable comprehensive river impact assessment; this work will be documented in the same report as the screening assessment of risk

~~5. Provide data from numbers 2 and 3 above for reconciliation against the risk assessment~~

[According to agreement signed by the CRCIA Team, dated October 1995]

The Tri-Party agencies are conducting CRCIA. The primary contractor conducting the screening assessment is the Pacific Northwest National Laboratory. Bechtel Hanford, Inc. provides technical and public involvement coordination with environmental restoration activities. Technical peer reviewers are evaluating the work. Their review comments are compiled by the Directors of the Oregon Water Resources Research Institute and State of Washington Water Research Center and forwarded to DOE for resolution. **[5/2/96 Dave Holland recommends deleting this paragraph; sdc feels there are readers who want to know who is responsible for what]**

Scope of the Screening Assessment [To remain for Data Report; to be moved to introduction of Part I for the compilation report]

The scope of the screening assessment is to evaluate the current risk to humans and the environment resulting from Hanford-derived contaminants. For the screening assessment, the segment of the Columbia River from Priest Rapids Dam (first impoundment upstream of the Hanford Site) to McNary Dam (first impoundment downstream of the Hanford Site) was selected as the study area. The parameters of the scope are:

Area: Columbia River (Priest Rapids Dam to McNary Dam), groundwater (0.8 kilometer/ 0.5 mile in from the river), and adjacent riparian zone **[4/25/96 Larry Gadbois says that in most reactor areas we are not going that far inland.]**

Time: January 1990 - February 1996 (date data were received for use in the screening assessment) with data gaps filled by earlier data where available

Contaminants: Published in Napier et al. (1995)

Receptor Species: Published in Becker et al. (1996)

Measured Media: Surface water, sediment, groundwater, external radiation, seeps and springs, biota ["Measured" addresses Paul Danielson's 4/30/96 concern about airborne sediment]

Work Integration and Documentation

The results of the initial phase of CRCIA are being reported in a series of documents (see Table P.1). These reports reflect the process involved in the screening assessment of current risk. First the documents containing pertinent data were identified. That information was published in two reports (Eslinger et al. 1994 and Miley and Huesties 1995), which were issued as final documents. **["Current" recommended as addition to second sentence by Tom Woods 4/16/96]**

These data documents helped to identify the most significant Hanford Site contaminants that affect the Columbia River. The winnowing process (limited by available funding) used to determine which of those contaminants should be evaluated in the screening assessment of risk was published in Napier et al. (1995) as a draft. The comments on the draft are being incorporated, and the contaminants information will appear as a section in the draft of the report on the screening assessment and requirements for a comprehensive assessment.**["Most significant" and limited funding concept proposed by Tom Woods 4/16/96, refined by sdc]**

Next, potential groups of people with different exposures to the Columbia River were identified. With information from the Hanford Site Risk Assessment Methodology (DOE 1995) and with input from the CRCIA Team, scenarios were written defining the pathways and exposures for the various groups. Input from the scenarios will be used in the screening assessment of human risk. The scenarios are described in Napier et al. (1996).[No change recommendations received as of 4/19/96]

Simultaneously, a focusing process (limited by available funding) was used to identify the most significant receptor species and select those to be evaluated in the screening assessment of ecological risk. The focusing process and the results are provided in this report.["most significant" and limit of funding concept proposed by Tom Woods 4/16/96, refined by sdc]

The monitoring data available, the lists of contaminants and species to be evaluated, and the selection rules developed by the CRCIA Team determined which data were selected for use in the screening assessment of human and ecological risk.[No change recommendations received as of 4/19/96]

As with the contaminants report, the scenarios, receptor species, and data selection reports are being published first as drafts for review. The reports published first as drafts will be compiled into one document on the screening assessment and requirements for a comprehensive assessment. That document will provide the results of the screening assessment and a definition of the essential work remaining to provide an acceptable comprehensive river impact assessment.[4/30/96 Change recommended by Paul Danielson which I need to clarify]

[References used in Preface]

42 USC 6901 et seq. October 21, 1976. *Resource Conservation and Recovery Act of 1976*. Public Law 94-580.

42 USC 9601 et seq (as amended). December 11, 1980. *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*. Public Law 96-510.

Becker, J.M., C.A. Brandt, D.D. Dauble, A.D. Maughan, and T.K. O'Neil. 1996. *Species for the Screening Assessment: Columbia River Comprehensive Impact Assessment*. DOE/RL-96-16-b, U.S. Department of Energy, Richland, Washington.

DOE - U.S. Department of Energy. 1994. *Columbia River Impact Evaluation Plan*. DOE/RL-92-28, Rev. 1, Richland, Washington.

DOE - U.S. Department of Energy. 1995. *Hanford Site Risk Assessment Methodology*. DOE/RL-91-45, Rev. 3, Richland, Washington.

Ecology - Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy. 1994. *Hanford Federal Facility Agreement and Consent Order*. Document No. 89-10, Rev. 3 (The Tri-Party Agreement), Ecology, Olympia, Washington.

Eslinger, P.W., L.R. Huesties, A.D. Maughan, T.B. Miley, and W.H. Walters. 1994. *Data Compendium for the Columbia River Comprehensive Impact Assessment*. PNL-9785, Pacific Northwest Laboratory, Richland, Washington.

Miley, T.B., and L.R. Huesties. 1995. *List of Currently Classified Documents Relative to Hanford Operations and of Potential Use in the Columbia River Comprehensive Impact Assessment, January 1, 1973-June 20, 1994*. PNL-10459, Pacific Northwest Laboratory, Richland, Washington.

Napier, B.A., N.C. Batishko, D.A. Heise-Craff, M.F. Jarvis, and S.F. Synder. 1995. *Identification of Contaminants of Concern*. PNL-10400, Pacific Northwest Laboratory, Richland, Washington.

Napier, B.A., B.L. Harper, N.K. Lane, D.L. Strenge, and R.B. Spivey. 1996. *Human Scenarios for the Screening Assessment: Columbia River Comprehensive Impact Assessment*. DOE/RL-96-16-a, U.S. Department of Energy, Richland, Washington.

RCW - Revised Code of Washington. 1985. "Hazardous Waste Management Act." RCW 70.105, Olympia, Washington.

Table P.1. Documents in Initial Phase of Columbia River Comprehensive Impact Assessment
[Use bold to highlight title of document in which this table appears and update the text in the "Status" column.]

Title	Document No.	Publication Date	Status
Data Compendium for the Columbia River Comprehensive Impact Assessment (Eslinger et al. 1994)	PNL-9785	April 1994	Final publication
List of Currently Classified Documents Relative to Hanford Operations and of Potential Use in the Columbia River Comprehensive Impact Assessment January 1, 1973 - June 20, 1994 (Miley and Huesties 1995)	PNL-10459	February 1995	Final publication
Identification of Contaminants of Concern (Napier et al. 1995)	PNL-10400	January 1995	Published as a draft - Issued first in January 1995 for review, then again in January 1996; comments from both review periods will be addressed and report will be a section in the *Screening Assessment and Requirements for a Comprehensive Assessment* report
Human Scenarios for the Screening Assessment: Columbia River Comprehensive Impact Assessment (Napier et al. 1996)	DOE/RL-96-16-a Rev.0	March 1996	Published as a draft - Then comments will be addressed and report will be a section in the *Screening Assessment and Requirements for a Comprehensive Assessment* report
Species for the Screening Assessment: Columbia River Comprehensive Impact Assessment (Becker et al. 1996)	DOE/RL-96-16-b Rev. 0	March 1996	Published as a draft - Then comments will be addressed and report will be a section in the *Screening Assessment and Requirements for a Comprehensive Assessment* report
Data for the Screening Assessment: Columbia River Comprehensive Impact Assessment	DOE/RL-96-16-c Rev.0	June 1996	To be published as a draft - Then comments will be addressed and report will be a section in the *Screening Assessment and Requirements for a Comprehensive Assessment* report
Screening Assessment and Requirements for a Comprehensive Assessment: Columbia River Comprehensive Impact Assessment	DOE/RL-96-16 Rev.0	December 1996	To be published as a draft - Will incorporate all previous draft publications (not those published as final) plus sections on site characterization, screening assessment of risk, and CRCIA Team statement of work to be done after the initial phase
Screening Assessment and Requirements for a Comprehensive Assessment: Columbia River Comprehensive Impact Assessment	DOE/RL-96-16 Rev.1	April 1997	To be published final - Will incorporate responses to comments and minority opinions should any comments not be reconciled

COMPILATION OF COMMENTS ON
HUMAN SCENARIOS FOR THE SCREENING ASSESSMENT: COLUMBIA RIVER COMPREHENSIVE IMPACT ASSESSMENT
DOE/RL-96-16a, Revision 0, Draft

No.	Reviewer	Location	Comments
1.	TPR	Sections 1-5, Tables of Exposure Factors	These tables, as constructed are more confusing than enlightening. It would seem more appropriate to place them in the Appendices as means to document the parameters and specific values used in the calculations. An alternative is to offer greater explanation of the factors which appear in the tables.
2.	TPR	Sections 1-5, Tables of Exposure Factors	There are several formatting and spelling errors in the tables - words are incorrectly hyphenated. The tables should be reviewed for editorial accuracy.
3.	TPR	Sections 1-5, Tables of Exposure Factors	Range of estimates for each parameter of the exposure estimate should be established this includes: a) exposure frequency A range should be established rather than a single rate determined. b) exposure duration A range should be established rather than a single duration time. c) dermal surface area A range should be established. d) air mass loading A range should be established. e) intake/contact rate Range of estimate has been established for the contact rates are included in the exposure factor tables, 2.1, 2.2, 3.1, 3.2, 3.3 ,4.1, 4.2, 4.3, 5.1 and 5.2. It is arguable that for any given day, soil is not ingested or inhaled, that no contaminate is absorbed through the skin, or that exposure to external radiation is experienced. Therefore the lower limit of these intake rates should be 0 for each of the media.
4.	TPR	Section 2.2, para 2-3; Section 3.1, para 1; Section 3.2, para 1, Section 3.3, para. 3.8; Section 4.1, para 1; Section 4.2; Section 4.3; Section 4.4, para 2-3; Section 5.0. para 2-3.	For the lay reader, these are the crucial paragraphs because they provide information the lay reader can check out with his/her own experience. They need to be emphasized far more than they are now. Options include: (1) Preparing a summary chart, as shown on Attachment A; (2) Repeating the key assumption in side bars that are part of each section. Having emphasized the key assumptions, it's probably OK that the remainder of each section is understandable only to technical people. The key thing is that the lay reader can scan these section, pick up the key assumptions, and then read on or scan to the next scenario.

No.	Reviewer	Location	Comments
5.	TPR	General	In general there has been a good deal of effort and careful thought in development of these human scenarios for the screening assessment. Unfortunately these efforts are uneven and in many cases apply detailed analysis of some parts of the exposure scenarios and yet neglect others. After reading through this document I am convinced that all figures should appear as a range of values rather then single values. These scenarios desperately cry for use of (at the least) a thorough sensitivity analysis and better yet, an uncertainty evaluation. As the document now exists, conclusions about the level of conservation used in developing these exposure assessments is not possible.
6.	TPR	General	It would be helpful if the document mentioned the readers for whom it is intended. If this series of documents is intended for non-technical persons concerned with effects of Hanford discharges, it should reference documents that may address concerns that have been raised. For example, a Dose Reconstruction Project* is apparently underway that would be relevant to human scenarios. It is important that the multiple documents issued by Hanford not appear to be in conflict. (*Till, John E. 1995. Building Credibility in Public Studies. American Scientist 83:468-473.)
7.	TPR	General	There are some ambiguities in this document that could lead to future misunderstandings. Is it the intent of this document (CRCIA Human Scenarios for the Screening Assessment) to consider only the potential contamination by Columbia River Water on crops, fish, meat, milk, etc. as if no other sources of Hanford contamination had occurred? If this is the case, then the calculated values that will occur in this report may disagree with those published elsewhere (for example in the Dose Reconstruction, which presumably will include airborne and river water contributions). Unless this limitation is carefully documented, some of the public will feel that the CRCIA Human Scenarios report is misleading. Specific examples are referred to for Sections 4.4 and 6.6, but in all cases it might be helpful to compare the values calculated in this report with those measured or reported elsewhere. If the calculated values are always higher than measured, that could be used to show that the Risk Assessment is conservative. If the calculated values in this report are lower than measured values, then it might suggest that airborne sources of contamination were significant as compared to current contamination for using Columbia River Water.
8.	TPR	General	The stated objective of this document is to provide a screening assessment of the current risks. However, it evaluates the current environmental conditions in terms of potential future uses, implying that future environmental conditions can not be any worse than the current conditions. Understandably, it would be difficult to extrapolate the future conditions and their risks, and create a document that has much credibility. Therefore, as environmental conditions change in the future, the risk assessment will need to be updated to account for changes in the migration and concentrations of contaminants, some of which may have a greater potential for human health risk than at the present time. The subsequent comprehensive risk assessment will need to be a dynamic document.
9.	TPR	General and Page 1.4	The authors have done a thorough job of identifying the numerous exposure pathways for the human scenarios. In the comprehensive risk assessment, can the human scenarios be combined to evaluate risk for a potential person with multiple exposure scenarios, e.g., a fish hatchery worker who is also a hunter/gatherer? Although there may be too many combinations of scenarios to evaluate all possibilities, the group could look at combining those scenarios that pose the most risk.
10.	TPR	General	The current methodology does not evaluate the synergistic risks from the complex chemical mixtures present at the Hanford site. Nor does it evaluate teratogenic, mutagenic, immunologic, developmental, or multigenerational effects. Please explain the process to be used to account for these potential sublethal effects.
11.	TPR	General	The uncertainties inherent in risk assessment requires the assessor to make value judgments in the face of scientific unknowns. In making these judgments it is imperative that the assessor estimated the range over which each parameter may vary. These estimates should rely on best scientific judgment. If a range is inappropriately narrow, risk may be underestimated. If a range is inappropriately wide, the risk may be overestimated. High levels of uncertainty reduce reliability. Even the most appropriate estimates of scientific uncertainty may result in an inability to make distinctions between competing risks [NRC, 1994 #3059]. It is the opinion of this reviewer the Human Scenarios for the Screening Assessment is misleading. The document defines exposure scenarios that can not be distinguished from one another. The uncertainties associated with the underlying parameters blurs their distinction.

No.	Reviewer	Location	Comments
12.	TPR	General	It is suggested that this point be illustrated in the final draft of this document. For each scenario listed in Human Scenarios for the Screening Assessment an intake factor should be derived from the default assumptions listed in tables 2-5 and formulas in the section 6.0 Exposure Equations. Risk =Intake Factor X concentration X Toxicity Factor The range of the intake factors should be compared to the range of uncertainty associated with the overall risk assessment. It is expected that the intake factors will range over two to three orders of magnitude. It is expected that the range of uncertainty of the overall risk estimate will be in the range of five to six orders of magnitude. The point should be clearly made that in this context, distinction between the scenarios can not be scientifically defended.
13.	TPR	General	It appears from the context of the Glossary and the Introduction that a "screening assessment of risk" is intended to be "comprehensive though not necessarily complete", in that all areas of significant adverse potential will be identified and none will be overlooked. This might be more explicitly stated. Perhaps this is what is meant by the sentence in the Summary and the Introduction that reads: "Risk will be assessed at the screening level for each scenario." Is this common technical jargon? It is to be hoped that "...review and modification by tribal technical staff..." for "...applications other than the screening assessment..." (p. 1.4 and p. 4.2) will not lead to scenarios sufficiently different to require additional screening assessments. It is perhaps worth additional emphasis in the Introduction that a screening assessment is the first step in a "top down" process. Thus, for example, it might be observed that some scenarios could be eliminated from further consideration if it is determined that no meaningful fraction of the population of the region participates in those activities.
14.	TPR	General	Because quality assurance (QA) is always a matter of serious concern to regulatory agencies, a section in the Introduction could be devoted to a discussion of the subject in the context of describing the choices of the source material listed in Section 7.0 References.
15.	TPR	General	This may be the subject for a later document, but it might be mentioned that this document makes no mention of the number of individuals or the fraction of the population that would be involved in these various scenarios. Because excess health effects resulting from very small amounts of pollutants are only discernible through statistical analyses of data on the exposed population, it makes no sense to include a particular scenario unless a statistically significant fraction of the population of the area would follow it. Thus, for example, is the ranger population big enough? Or is there only one ranger (Lone Ranger)? Some discussion of the sizes of the exposed populations would seem appropriate in this connection.
16.	TPR	General	It would be helpful to include some details in this document about the further development of the scenarios as well as how they will be used in the risk calculations. For example, a few sample calculations could be done using the equations in Section 6.0, and showing what elements are taken from what Tables.
17.	TPR	General	The document would be easier to understand if its place in the context of others in the series were explained. In particular, some information should be given about the actual magnitudes of the various populations involved in the various scenarios and about the actual radioisotopes and/or other pollutants of interest and concern.
18.	TPR	General	Was there some consultation with people other than DOE and its contractors in developing these scenarios? If so, a description of this consultation would lend credibility, particularly if the scenarios are consensus scenarios.

No.	Reviewer	Location	Comments
19.	TPR	General	This document is one step in the preparation to conduct screening calculations of risk for several human use scenarios for the Columbia River. It appears that a reasonable selection of plausible scenarios has been identified. However, it is not clear to this reviewer how combinations of scenarios might be handled. For example, what about an agricultural resident who also hunts and fishes a great deal?
20.	TPR	General	It does not seem evident whether individual or population risks (or both) will be calculated. This might affect the approach taken to develop the human use scenarios, and the type of data needed.
21.	TPR	General	It appears that this document deals only with existing, residual contamination from past activities at Hanford. Since we are concerned about future use of the site environment by people, should this effort also address potential future accidents or new discharges? If so, the screening calculation equations in Section 6.0 would not seem adequate to deal with pulsed releases or other time-dependencies.
22.	TPR	General	It seems that the Native American scenarios are going to require a good deal of information yet, and this is acknowledged in the report. What is not clear to me, is how will such information be obtained, especially since some of it may be sensitive or confidential?
23.	TPR	General	Another problem with the consistent reference to potential overestimation of exposure without acknowledgment of sources of potential underestimation of exposure is that the final risk estimates won't be taken seriously. People might say about any of the estimated risks, "Oh well, REALLY these are OVERESTIMATIONS." This, then, reveals the unreality of the exercise being undertaken. This report needs to be scientifically defensible, or it is simply a charade.
24.	TPR	General	The document does NOT make clear how this initial CRCIA screening assessment, of which this human scenario section is one element, will be used. It is implied (1.1., page 1.1) that it will be used to decide among current land use proposals. If so, then if this initial phase of the CRCIA indicates high risks of damage, this may serve as an excuse to simply abandon this site to "industrial" uses. If this is the purpose of the CRCIA screening assessment, i.e., to justify abandonment of the site and avoid responsible clean-up, then this screening assessment is an inappropriate process. The document needs to be very clear about the uses to which this screening process will be put. The statement of scope regarding the CRCIA should include, on an equal basis, two major uses for the CRCIA screening assessment: To focus on the need for clean-up (i.e., show how wildlife and humans are at risk) and to focus on what clean-up will be necessary to accommodate various long-term uses of the area by humans. This is a critical problem: Are we looking at hazards from the point of view of letting them remain, and simply adding to them by establishing industries on the site; or are we looking at hazards as guidance to what needs to be cleaned up now and later on the Hanford Reach?
25.	TPR	Page vi, CRCIA Long-Term and Short-Term Objectives	The term "significant" in the following sentence must be eliminated, due (1) to our general ignorance of what hazards are significant ecologically; and (2) the meaninglessness of the term. "Ecological resources in the study area will be evaluated to determine if current contaminant condition pose significant hazards to biological communities."
26.	TPR	Page vii	This reviewer was uncertain why the specific dates of January 1990 -February 1996 were chosen. If this is a comprehensive assessment then this narrow range of dates seems unjustified. Why is the ending date February 1996, can't new data be added as they become available? If these dates were chosen by mutual agreement, cite memorandum. If not, cite mechanism to add updates in this section.

No.	Reviewer	Location	Comments
27.	TPR	Page ix, para 2	The consistent reference to overestimation of exposure inaccurately implies that we KNOW we have overestimated exposure. Since it's an estimation, however, how can we know it's an overestimation? Instead, the report must say some equivalent of: "Some elements of the exposure scenario may be overestimated; others may be underestimated. Here are some of the potential sources of overestimation, at least for some of the humans. Here are some of the potential sources of underestimation, at least for some of the humans."
28.	TPR	Page ix, para 3	Another problem with the consistent reference to potential overestimation of exposure without acknowledgment of sources of potential underestimation of exposure is that the final risk estimates won't be taken seriously. People might say about any of the estimated risks, "Oh well, REALLY these are OVERESTIMATIONS." This, then, reveals the unreality of the exercise being undertaken. This report needs to be scientifically defensible, or it is simply a charade.
29.	TPR	Page ix, para 3, and Page 1.1, para 3	Two HSRAM scenarios are selected here but four of them are mentioned on p. x and two additional ones on p. 1.2.
30.	TPR	Page ix, para 3 Page 1.1, para 2	This para is repeated in two places. It has two problems: (1) It loses the storyline -- the big picture gets lost in the details, and (2) It introduces HSRAM without any context, and the non-technical reader won't have the foggiest what to do with it. Here's an approach: "Scenarios (word pictures that describe possible future conditions) have been developed to reflect how humans may use the Hanford Site in the future. Based on guidance from the CRCIA Management Team, the focus of these scenarios is near-term [defined as what?]. In addition, the scenarios are site-specific; that is, they not only describe human activities on the site, they also describe where on the site these activities will occur. "Because the scenarios are site-specific, it was necessary to go beyond the risk scenarios currently in use on the site. DOE has developed generic scenarios for the Hanford Site (DOE 1995), but these do not indicate where on the site the activities would occur, nor did they break out activities by specific groups. [Is this assumption on my part correct?] A methodology, called the Hanford Site Risk Assessment Methodology (HSRAM), has been developed to provide a standardized methodology for risk assessment across the site. Two of the scenarios provided in the HSRAM -- an industrial scenario and a recreational scenario -- were suitable for the purposes of this study, with modifications. The other scenarios were developed in consultation with _____. "The human scenarios that will be used ..."
31.	TPR	Page x, top, and Page 1.2, top	The General Population Scenarios are described as modified to use Columbia River water instead of groundwater, while Tables 5.1 and 5.2 appear to use river water in addition to groundwater.
32.	TPR	Page xi	The definition of "bioaccumulation" is unclear; suggested substitution: bioaccumulation is a synonym for biological magnification; biological magnification is the increase in concentration of some material in organisms compared with its concentration in the environment.
33.	TPR	Page xi	The definition of "bioconcentration factor" should include a statement as to whether or not the ratio is a fresh or dry weight value.
34.	TPR	Page xi	The definition of "biotic" is unclear (animate suggests movement); suggested substitution: pertaining to life.

No.	Reviewer	Location	Comments
35.	TPR	Page xi	The definition of "carcinogenic" is unwieldy; suggested substitution: carcinogen: a cancer promoting or causing agent.
36.	TPR	Page xi	The definition of "concentration" is unclear; suggested substitution: amount of a substance in an amount of another substance (e.g., milligrams of salt per liter of water).
37.	TPR	Page xi	In the definition of "Ci," note that the term is fully defined in the text below.
38.	TPR	Page xi	In the definition of "curie," it is defined in terms of Becquerel, but Bq is not defined.
39.	TPR	Page xii	The definition of "deterministic value" is unwieldy; suggested alternative: a single value used in a calculation; for example 20 miles per gallon is used to estimate the fuel efficiency of a car; actual gas mileage varies considerably, but averages this value; so it is the one used in calculations.
40.	TPR	Page xii	"irradiation" is defined as exposure of an object to ionizing radiation, but ionizing radiation is not defined.
41.	TPR	Page xii, <u>Glossary</u>, "internal exposure"	"Internal exposure" should include exposure during embryogenesis.
42.	TPR	Page xiii	The "rad" is defined in terms of absorbed dose, but absorbed dose is not defined or explained.
43.	TPR	Page xiii	"sensitivity" is unclearly defined.
44.	TPR	Page xiii, Glossary, "rem"	Provide a more informative definition of rem; see, e.g., <u>Closing the Circle on the Splitting of the Atom</u> (Department of Energy 1995), p. 39.
45.	TPR	Page xiii	The definition of "screening assessment of risk" seems confusing. It should not be described as having "limited scope", but as having limited depth and broad scope. This would fit better with the stated objective of finding (all?) areas of significant potential for adverse effects.
46.	TPR	Page xiii, <u>Glossary</u>, "risk assessment"	This definition of "risk assessment" should add the phrase "considered in isolation from other substances or activities" at the end of the sentence if you are describing the risk assessment as considered in this document. Instead, comprehensive assessment of risk means assessment of the full range of potential hazard, due to cumulative impacts, synergism, individual susceptibility, etc. It should be made very clear to readers that a comprehensive risk assessment is NOT being attempted with the current framework. The skirting around the issue of whether this is a "screening risk assessment" or a "comprehensive impact assessment" is not appropriate. If the process is going to look at individual chemicals and radionuclides in isolation from each other, under current conditions, in organisms modeled as if they were unexposed to other hazardous substances and conditions, then this is NOT a comprehensive risk assessment. The definition of risk assessment must distinguish between single-substance limited risk assessment and assessment of the real risks.

No.	Reviewer	Location	Comments
47.	TPR	Page xiii, Glossary, "screening assessment of risk".	Should read, "...the objective of the screening assessment of risk is to identify SOME areas where potential exists for CERTAIN adverse effects. [Note: I eliminated the word, "significant," because it has not been defined, and significance is in the eye of the beholder.] It is impossible to "...identify [all] areas where significant potential exists for adverse effects."
48.	TPR	xiii, Glossary, "sensitivity"	Should read, "determination of the parameters and pathways that contribute most to uncertainty in dose CALCULATIONS."
49.	TPR	Page xiv, Glossary, "uncertainty"	Should read, "measure of THE LIKELIHOOD OF A CERTAIN AMOUNT OF VARIABILITY in model parameters or dose estimates." You don't know the variability, so you can only estimate the likelihood of falling within a particular range of variability."
50.	TPR	Page 1.1, 1.0 Introduction	"...Columbia River so that SOME OF THE IMPACTS of contaminants..."
51.	TPR	Page 1.1, para 2 and. Page ix, para 3	Two HSRAM scenarios are selected here but four of them are mentioned on p. x and two additional ones on 1.2.
52.	TPR	Page 1.1, para 2 and Page ix, para 3	The document does NOT make clear how this initial CRCIA screening assessment, of which this human scenario section is one element, will be used. It is implied (1.1., page 1.1) that it will be used to decide among current land use proposals. If so, then if this initial phase of the CRCIA indicates high risks of damage, this may serve as an excuse to simply abandon this site to "industrial" uses. If this is the purpose of the CRCIA screening assessment, i.e., to justify abandonment of the site and avoid responsible clean-up, then this screening assessment is an inappropriate process. The document needs to be very clear about the uses to which this screening process will be put. The statement of scope regarding the CRCIA should include, on an equal basis, two major uses for the CRCIA screening assessment: (1) to focus on the need for clean-up (i.e., show how wildlife and humans are at risk) and (2) to focus on what clean-up will be necessary to accommodate various long-term uses of the area by humans. This is a critical problem: Are we looking at hazards from the point of view of letting them remain, and simply adding to them by establishing industries on the site; or are we looking at hazards as guidance to what needs to be cleaned up now and later on the Hanford Reach?
53.	TPR	Page 1.2, para 4	This sentence states that only the hunter\fisher would consume biota. Couldn't one imagine that both the ranger and the recreational visitor would consume biota? This is especially important since the first paragraph on this page suggests that "high-end" exposures are presented.
54.	TPR	Page 1.2, top and page x, top	The General Population Scenarios are described as modified to use Columbia River water instead of groundwater, while Tables 5.1 and 5.2 appear to use river water in addition to groundwater.
55.	TPR	Page 1.2, para 2	This para needs clarifying. Perhaps it might read: "The scenario definitions are based on activities rather than location. To illustrate: If the assumption is made that a particular location will in the future be a wildlife refuge, it might be used by a ranger, hunter/fisher, or a recreational visitor. Each of these users would have an entirely different exposure, based on the time spent in that location, and the type of activity. Therefore the exposure and risk ..."

No.	Reviewer	Location	Comments
56.	TPR	Page 1.2, para 2	Sentence reading: "The exposure scenarios selected....:" I don't think this caveat is clear. I suspect it needs to read something like: "In order to develop exposure scenarios, it was first necessary to make assumptions about probable future land uses and cleanup levels. These topics are the subject of a number of other studies, and many decisions about these questions have not yet to be made. The exposure scenarios used here are based on general agreement by the CRCIA Team, for purposes of this study only. They do not represent recommendations by the team as to actual land use or cleanup levels."
57.	TPR	Page 1.2, para 3	"The general intent of the screening assessment of human risk is to overestimate exposures to have some degree of certainty that the true exposure will be lower that the estimated exposure." There is no mention here that intentional overestimation has the effect of reducing the reliability of the risk estimate. This must be stated clearly before this comment is resolved.
58.	TPR	Page 1.2, para 3	How can it be shown that the "....same degree of conservativeness is applied to both to suburban and subsistence/traditional scenarios."?
59.	TPR	Page 1.2, para 4	It is stated that "--only the hunter/fisher would consume biota." Certainly, other people of other lifestyles could consume fish & game from recreational activities.
60.	TPR	Page 1.2, para 5	Is Columbia River water used instead of or in addition to groundwater, as seems to be implied in Tables 5.1 and 5.2?
61.	TPR	Page 1.2, para 5	I am not clear as to why only surface water is dealt with in these scenarios. It would seem that groundwater could actually be used and that it would be likely to have higher contaminant levels in some cases than would surface water. I think at least, the rationale should be given for this.
62.	TPR	Page 1.2, para 5	Native American contaminant pathways and exposure factors truly are different and more complex than this document or HSRAM indicate. This reviewer agrees that tribal involvement will be needed to assist the authors of future risk assessments in a more complete evaluation.
63.	TPR	Page 1.2, para 5, lines 7-9	More information is needed to understand the impact of "limited tribal information". Specific information should be given here or in a later section so reviewer can understand just how limited the data are and how these limitations would potentially impact assessment as given. Sensitivity analysis is needed.
64.	TPR	Page 1.3, 1.2.1 Pathways	This reviewer was reassured by this discussion of the approach used for the exposure analysis in this screening assessment. Some attempts at sensitivity analysis is critical in this report to understand the possible range of exposures.
65.	TPR	Page 1.3, 1.2.1 Pathways	"The media considered are soil, air, seep/spring water, surface water, sediment, biota, and cultural." The inclusion of cultural as a media to be considered is not scientifically defensible. This is not to say that cultural values should not be considered in the impact assessment. Without question, the values of all the stakeholders should be respected and duly considered. However, culturally values should not be injected into a scientific assessment. This comment will be resolved by removing consideration of cultural media from the definition of scenarios.

No.	Reviewer	Location	Comments
66.	TPR	Page 1.3, 1.2.1 Pathways	"The general philosophy in defining the scenario for the human risk assessment is to avoid screening out pathways, even if they only contribute limited exposure." This is not a scientifically defensible approach. It is appropriate to eliminate from consideration minor pathways that add large amounts of uncertainty to the overall exposure assessment. The net effect of attempts to evaluate every possible exposure is that reliability of the risk assessment is compromised to the extent that it can not be used for risk-based decision making. This comment will be resolved by modifying the approach to focus only on those pathways determined to contribute significant intake of each contaminate of concern. It is the opinion of this reviewer that ingestion and inhalation of soil, ingestion of ground and surface water, pathways should be considered. The external exposure pathway should also be evaluated. However, the infinite slab assumption underlying the external exposure pathway should be replace with a probabilistic approach.
67.	TPR	Page 1.3, para 1	The first sentence has a nice ring to it, but it is not very clear. The rest of the paragraph is not much better. It has more verbiage than needed to describe a few simple concepts. The remainder of Section 1.2.1 Pathways is much better.
68.	TPR	Page 1.3, para 1	In the first sentence, "pathways" is defined using another word "media" which is even more jargony and incomprehensible. In fact, "media" is worse, because people have another definition of that word in their minds. It might read: "The first step is to define how people can be exposed to contaminants, the "pathways" of exposure. To reach people, the contaminants must move through some "media" such as soil, air, seep/spring water, surface water, sediment, biota, and cultural... ["cultural" needs to be expanded upon somewhat -- how is it comparable with air, water, etc.]? The last para on page 1.2 also uses all these terms, but the reader may be willing to jump over that para on the assumption that if they read on they will understand. But if it isn't explained right away, then you lose them.
69.	TPR	Page 1.3, para 1	Is "cultural" a type of media?
70.	TPR	Page 1.3, para 2	The ingestion items listed did not include crops and herbal medicines.
71.	TPR	Page 1.3, para 3	The statement that the "highest exposure is automatically assigned to the most contaminated source" is unclear. Does this include comparing different pathways of exposure and different nuclides which may have different concentration mechanisms in progress? I'm not sure exactly what is being stated in this sentence.
72.	TPR	Page 1.3, para 3	Here, as elsewhere, there are signs of excessive conservatism. Conservatism that is obviously excessive should not be used. It can lead to problems in later analysis, as a result of being forced (politically) to continue to work with what was a bad idea to start with. This can then lead to propagation of errors, which may produce absurd results. For example; ".... the resulting effect is the highest exposure is automatically assigned to the most contaminated source." seems plausible but not certain, and fraught with possible difficulties.
73.	TPR	Page 1.3, para 3	The example given of two mutually exclusive components is not clear to the lay reader. First of all, they'll spend so much time trying to figure out what resuspended soil and resuspended sediments are that they'll lose track of the main point. Since they're not entirely clear what resuspended soil and resuspended sediments are, its won't be intuitively obvious that they are mutually exclusive. The writer seems to assume that the reader will know why they are contradictory. The example needs to be simplified, or more explanation provided for why the different components are contradictory.
74.	TPR	Page 1.3, para 3	The wording in this paragraph is awkward and hard to understand.
75.	TPR	Page 1.3, para 3	"Each scenario is made up SOME components that are potentially exclusive, AND SOME THAT ARE TO BE ADDED..."

No.	Reviewer	Location	Comments
76.	TPR	Page 1.3, para 3	State that this is ignoring exposures from body burdens and during gestation.
77.	TPR	Page 1.3, 1.2.2 Exposure Factors	It is important that this section does recognize the need for tribal specific values for exposure factors rather than default values. This reviewer was unclear what mechanism exists to incorporate this information.
78.	TPR	Page 1.3, para 4	Is it possible to say. "Each scenario contains human activities that lead to specific kinds of exposure. After analysis of the scenarios, the exposure factors that were common throughout the scenarios were intake/contact rate..... A few additional exposure factors were identified that apply to only certain media and exposure routes. For instance ...."
79.	TPR	Page 1.3, para 5	The whole paragraph needs rewording to make it understandable. The writer just assumes that the reader knows what default values are. Some definition or example is needed. Then the writer assumes that the reader has enough background to understand why culture-specific activities might require an increase.
80.	TPR	Page 1.3, para 5	This suggests that the default HSRAM values should be increased. Isn't it possible that some may need to be decreased? Also, I don't see why culture-specific practices do not need to be specified. Do you choose the worst possible case and apply that to all cultures?
81.	TPR	Page 1.3, para 5	Reference to activities that are "performed predominantly by women of childbearing age" does not take into account the fact the cumulative, life-time dose of women to certain bioaccumulative and/or persistent toxic chemicals. That is, a woman of childbearing age is at risk from all past exposures, not just exposures that take place during the years of childbearing age. Likewise, to the degree that the risk assessment acknowledges that mothers can affect their infants during "childbearing age," the risk assessment must acknowledge that the embryos and infants of women of "childbearing age" are being exposed to hazardous substances, and that these affect their ability to withstand or "assimilate" other hazardous substances, at later ages. So far, the proposed framework for "human scenarios" makes no acknowledgment of the potential effect of pre-, peri-, and post-natal exposures on later exposures.
82.	TPR	Page 1.4, para 1	This reviewers feels that the approach delineated in this paragraph may not be appropriate. Some effort should be made to understand the impact of just basing risk assessments on separate scenarios versus lifestyle approaches which might incorporate a variety of scenarios. It would seem logical that a person who would choose to work as a ranger could potentially be one who would enjoy the out-of-doors and thus might also be a hunter and fisherperson. This screening approach could significantly underestimate total exposure.
83.	TPR	Page 1.4 and General	The authors have done a thorough job of identifying the numerous exposure pathways for the human scenarios. In the comprehensive risk assessment, can the human scenarios be combined to evaluate risk for a potential person with multiple exposure scenarios, e.g., a fish hatchery worker who is also a hunter/gatherer? Although there may be too many combinations of scenarios to evaluate all possibilities, the group could look at combining those scenarios that pose the most risk.
84.	TPR	Page 1.4, para 1	This approach does not seem conservative to me.
85.	TPR	Page 1.4, para 2	This paragraph discusses problems when location of activities and hence potential exposures is unknown. No solution or suggestion is given to estimate how significantly the exposures might change. The impact assessment could include a sensitivity analysis that would show how much higher exposures could range if culture-specific activities took place at areas of known high contamination. As this is a "screening assessment" such analyses could give you an upper estimate of potential exposures.
86.	TPR	Page 1.4, para 2	The meaning of this last paragraph is unclear.

No.	Reviewer	Location	Comments
87.	TPR	Page 1.4, para 2	There's very little in this paragraph that is understandable to the non-technical reader.
88.	TPR	Page 1.4, 1.3 Stochastic Variability	It is not scientifically defensible to limit the consideration of variability to estimates of contaminate concentrations. It should be clearly stated that there is variability in each of the parameters of a risk estimate. Resolution of this comment should include estimates of variability for each of the following parameters with regard to each suspected contaminant. Risk = Intake Factor X concentration X Toxicity Factor. This comment will be resolved by including estimates of the variability for each: 1) the concentration of the contaminate. These are referred to in 1.3 but not incorporated into this document or, to my knowledge, are estimates of range of uncertainty incorporated into, Identification of Contaminants of Concern. 2) the intake factor: a) exposure frequency A range should be established rather than a single rate determined. b) exposure duration A range should be established rather than a single duration time. c) dermal surface area A range should be established. d) air mass loading A range should be established. e) intake/contact rate Ranges of estimate established for the contact rates are included in the exposure factor tables. 6) the toxicity factor The US EPA has compiled and reviewed the scientific literature available for each of the substances listed as a contaminate of concern (PNL-10400 UC-630 DRAFT). For many of the contaminates, factors for threshold toxicity and/or cancer potency have been defined. These toxicity factors are set by consensus among toxicologists who review the available information. It is frequently the case that inadequate scientific data exists. This reduces the confidence in a specific toxicity factor. In the face of such uncertainty, toxicologists choose to error on the side of public safety and have incorporated a safety factor into their estimates. The magnitude of the safety factor reflects the degree of scientific uncertainty. The safety factors attached to the assessment of toxicities for the Columbia River contaminates of concern, antimony, manganese, mercury, carbon tetrachloride, tichloroethylene and non-radioactive isotopes of uranium are all 1,000. (This means the benchmark dose for adverse effects has been divided by 1000. For example, a reference dose of .01 mg/kg becomes .00001 mg/kg.) The safety factors for chlordane is 100, for chromium III is 300, for chromium VI is 500 and for non-radioactive isotopes of strontium the safety factor is 300 (PNL-10601 UC-600). This means that the uncertainty associated with many of the non-radioactive contaminate identified is two to three orders of magnitude. It is not defensible to overlook the toxicological uncertainties in the process of evaluating the reliability of the risk estimates.

No.	Reviewer	Location	Comments
89.	TPR	Page 1.4, 1.3 Stochastic Variability	Again, virtually everything in this paragraph is written in language that only has meaning for other technical people.
90.	TPR	Page 1.4, 1.3 Stochastic Variability	I might suggest using "reasonable" and "maximum likely" parameter estimates because I don't see much utility in the "minimum" estimates.
91.	TPR	Page 1.4, 1.4 Key Points	These are the simplest, clearest points in the chapter. It makes me wonder whether the chapter can't be organized around them. Or, major points could be put in a summary box to make them stand out.
92.	TPR	Page 1.4, Key Point 2	The word "assumptions" implies much guesswork. Will real data be used where possible so at least one can be a bit more confident in the answers?
93.	TPR	Page 1.4, Key Point 3	This reviewer would encourage a sensitivity analysis. This would seem to be an essential component in the impact assessment.
94.	TPR	Page 1.4, Key Point 4	This reviewer applauds the report for recognizing the need for review and modification by tribal technical staff before use in applications other than screening assessment of risk. Is there a timetable for obtaining this information before the impact assessment is complete?
95.	TPR	Page 1.4, Key Point 4	Once more, it might be useful to state that scenario modifications will only be needed to increase their level of detail, and normally will never lead to a requirement for additional screening assessments. The concept of a screening assessment implies this.
96.	TPR	Page 2.1-2.4, 2.0 Industrial/ Commercial Scenarios	The air inhalation rate for the industrial worker and fish hatchery worker were set at 20 m^3 per day (Tables 2.1 and 2.2), whereas the Ranger scenario (Table 3.1) had this individual assigned an inhalation rate of 10. Later the recreational visitor (Table 3.3) is assigned a value of 20. What is the basis for the substantial difference in inhalations volumes each day?
97.	TPR	Page 2.1-2.4, 2.0 Industrial/ Commercial Scenarios	The HSRAM industrial worker scenario is not modified in this screening assessment. One shortcoming of the HSRAM approach is that it does not account for worker exposure to hazardous chemicals in the workplace but only to incidental environmental exposure. Please discuss any current efforts to more comprehensively determine the risks to a worker who has chemical exposures via multiple pathways(work-related, environmental, and home-related), including natural exposures (e.g., natural radiation) and accepted intentional exposures (e.g., medical x-rays).
98.	TPR	Page 2.1, para 1, line 1	I suggest replacing "applicable" with "likely".
99.	TPR	Page 2.1, para 1	Could part of the job include contact with environmental media?
100.	TPR	Page 2.1, para 2	Second sentence uses the word "benchmarked." Many different meanings exist for this word. Should authors use the word compared? Last sentence says that written data supplied by interviewed employees has not been validated. Is there a plan to validate or to use sensitivity analysis to look at impact if estimates are off by 10%, 20%, 50%? Specify.
101.	TPR	Page 2.1, para 2	Assumes the reader knows what "benchmarking" is. Explain, or use non-jargon language.
102.	TPR	Page 2.1, para 2	The word "benchmarked" may not be clear to some readers.

No.	Reviewer	Location	Comments
103.	TPR	Page 2.1, 2.1 Industrial Worker (Unmodified HSRAM Definition) and Table 2.1 on page 2.2	Is this worker a male worker? Or are exposure factors given as an average between male/female worker? Although this document refers to standard HSRAM, shouldn't a few more details be given in this report so a reader can understand the implications of these factors without referring to additional documents? Although page 1.4 states that minimum and maximum are from best expert judgment of authors, some of these exposure values are frequently cited and referenced. This table and all subsequent tables should reference sources of factors if using accepted, cited values versus professional guesses. When possible I would cite original documents and not just site specific documents such as the HSRAM (Tables 5.1 and 5.2 are good examples). It is interesting in Table 2.1 that only the intake/contact rate factor had any range of values given. All other factors such as exposure duration and frequency were given as absolute values.
104.	TPR	Page 2.1, para 3	"The HSRAM industrial scenario is included without modification." Included in what? Should the reader have to have a readily available copy of HSRAM to understand this report? What is the scenario? Why isn't there a description comparable to that of the other scenarios? What's so significant about using a HSRAM scenario, [e.g. it's an accepted methodology that has been previously reviewed by multiple parties]? Why aren't the groundwater pathways "activated?" Are you really saying: "The HSRAM scenario is primarily concerned with exposure to groundwater. However, industrial workers will not [or are unlikely to be] exposed to groundwater, so the critical exposure is to ..."
105.	TPR	Page 2.1, para 4	Explain 'steelhead-X-rainbow trout'
106.	TPR	Page 2.1, para 5, line 2	"pilot"?
107.	TPR	Page 2.2, Table 2.1	The intake/contact rate (per day) for dermal contact for the soil pathway is given as 0.2 mg/cm^2; the dermal intake/contact rate for the surface water pathway is 0.17 hr. This is confusing, as both use "skin surface area" as part of the other factors.
108.	TPR	Page 2.2, Table 2.1, col 5	What is the rationale for the different values in this column? Are there references to back up these values?
109.	TPR	Page 2.2, Table 2.1	Explain "shielding factor" and indicate the data base for it.
110.	TPR	Page 2.3, Table 2.2	The external dose pathway for surface water includes a "geometry correction." Is this term explained or defined in the text?
111.	TPR	Pages 2.2 and 2.3, Tables 2.1 and 2.2	Comparing the tables of exposure factors with the equations in Section 6.0, it is not clear whether the inhalation factor of 20 m^3 is used for a 24-hour period or an 8-hour period. The figure of 20 m^3 is very low for a worker doing physical work if it represents a 24-hour period, as it more closely represents the rate of inhalation for an 8-hour period. Thus, the figure of 20 m^3 should not be plugged into the Section 6.3 and 6.4 equations for the Inhalation Rate variable unless converted to a daily rate.
112.	TPR	Pages 2.2 and 2.3, Tables 2.1 and 2.2	HSRAM and this document assume a non-conservative shielding factor for the external exposure to gamma emitters. What is the basis for this assumption? Is exposure to alpha and beta emitters negligible? If this document is to take a conservative approach, an assumption of no shielding may be more appropriate. Please discuss rationale for the approach used.
113.	TPR	Page 2.3, Table 2.2	Explain "Geometry correction" and indicate the data basis for it.

No.	Reviewer	Location	Comments
114.	TPR	Page 2.4	Several of the factors in this exposure scenario are changed from standard HSRAM; inadequate details are given for readers to understand why and how these factors were changed. For example, in determining the amount of external radiation from river water in the basins, "geometric factors," were identified as accounting for "some equivalent shielding." These changes need to be presented in detail so a reader can independently arrive at the same numbers and conclusions. This is true for all of the changes made in this scenario. Note: Although earlier notes in this document suggest that an upper end estimate of exposure was calculated, this reviewer would suggest that an exposure frequency of 250 days/year for this scenario is a potential underestimate.
115.	TPR	Page 2.4, para 3	The value of 1 hour per day exposure of the Fish Hatchery worker to water seems low.
116.	TPR	Page 2.4, para 3	Explain "geometry factors" and "reduced body surface area". Also absorption is misspelled.
117.	TPR	Page 3.1, 3.0 Wildlife Refuge/Wild and Scenic River Scenarios	The dermal contact rate of 0.2 mg/cm^2 should be increased for the hunter and ranger scenario as these individuals will spend a great deal of time in contact with soils and sediments.
118.	TPR	Page 3.1-3.9	The air inhalation rate for the industrial worker and fish hatchery worker were set at 20 m^3 per day (Tables 2.1 and 2.2), whereas the Ranger scenario (Table 3.1) had this individual assigned an inhalation rate of 10. Later the recreational visitor (Table 3.3) is assigned a value of 20. What is the basis for the substantial difference in inhalations volumes each day?
119.	TPR	Page 3.1, para 1	The first sentence discussion "undisturbed ecologies" is awkward. Ecology is the study of organisms and their relation ship to their environment. Ecosystems are the community plus its habitat. Substituting "undisturbed ecosystems" would be preferred.
120.	TPR	Page 3.1, para 1	"--ecologies" is a misuse of the word.
121.	TPR	Page 3.1, para 2	Wild and Scenic River Scenarios. Second paragraph, second sentence. Is it known that rangers will not be allowed to live onsite? Add citation. On page 3.2 uses allowed by the Wild and Scenic River Act include "occupation of homes that exist on the date of the enactment". Are there any houses that could be used by rangers or others for residential use?
122.	TPR	Page 3.1, para. 2	How can one assume that rangers would not live on the site?
123.	TPR	Page 3.1, para 2	"The following recreational and scientific scenarios are possible under the wildlife refuge designation although not all of them were the basis of specific exposure scenario development." All of the scenarios should be based in science and scientifically defensible. It is unclear how a recreational scenario is distinguished from a scientific scenario.

No.	Reviewer	Location	Comments
124.	TPR	Pages 3.1-3.2, para 4	"...human exposure scenarios in addition to those provided in the HSRAM recreational scenario will be needed to assess risk." This suggest that risk assessment is powerful enough to distinguish risk under a variety of scenarios. This misleads the public. This comment will be resolve by defining the power of risk assessment to distinguish different exposure scenarios. For each scenario listed in Human Scenarios for the Screening Assessment an intake factor should be derived from the default assumptions listed in tables 2-5 and formulas in the section 6.0 Exposure Equations. Risk =Intake Factor X concentration X Toxicity Factor The range of the intake factors should be compared to the range of uncertainty associated with the overall risk assessment (this is derived by multiplying the uncertainties associated with estimating the concentration and the toxicity). It is expected that the intake factors will range over two orders of magnitude. It is expected that the range of uncertainty of the overall risk estimate will be in the range of five to six orders of magnitude. The point should be clearly made that in this context, distinction between the scenarios can not be scientifically defended.
125.	TPR	Page 3.2, para 1, bullet 4	"Hydrology and geology suitable for siting of nuclear reactors and radioactive wastes" are NOT two of the "nationally significant features of the Hanford Reach." The Reach is NOT suitable for such siting. The daunting prospects of "clean up" attest to the fact that the Hanford Reach was NOT suitable for siting of nuclear reactors and radioactive wastes. At best, a national significance of the Hanford Reach is that it was a site that humans thought might be suitable.
126.	TPR	Page 3.2, para 1	"Nationally significant features of the Hanford Reach" include "plant, fisheries, and wildlife habitat and diversity" and a "richness of Native American cultural resources."
127.	TPR	Page 3.2, last para.	"--and ingests game (and fish ?) taken.
128.	TPR	Page 3.3, para 2, bullet 2	What is the basis for the shielding reduction factor for HSRAM soils? What is a shielding reduction factor?
129.	TPR	Page 3.3, para 2, bullet 3	You need to explain what one contact event per day is. In the equations in §6.2, I don't see where a contact event figures in, unless it is exposure frequency to soils. Bruce Napier indicated in an email communication to me (15 April) that "Contact events are really just the number of days that the person gets this dirty." A "contact event" and the data on which the calculation is based need to be explained.
130.	TPR	Page 3.3, para 2, bullet 3	What is the basis of the soil adherence rate?
131.	TPR	Page 3.3, para 2, bullet 4	If inhalation is "assumed to occur at all times while the ranger is on site,", why is the ranger's inhalation assumed to be 10 m^3, but a hatchery worker's inhalation is assumed to be 20 m^3 (Table 2.2, p. 2.3)?
132.	TPR	Page 3.3, para 2. bullet 5	The ranger is assumed to inhale at the rate of 1.2 m^3 per hour; this is the standard breathing rate for light activity work; is a ranger job (with hiking, lifting, etc.) considered light activity?
133.	TPR	Page 3.3, para 2, bullet 5	Air Inhalation. The inhalation rate of 10 m^3 for a 9-hour period is low for an individual doing physical activity such as that which a ranger would be expected to do in a typical day.

No.	Reviewer	Location	Comments
134.	TPR	Pages 3.3-3.7, Sections 3.1 and 3.2	For all proposed scenarios range of estimates should be used rather than specific determinations. This comment is made with regard to pathways that include soil external exposure, soil dermal contact soil inhalation, air inhalation. It is the opinion of this reviewer that the estimates currently used for these exposures are gross over estimates. This comment will be resolve by using more realistic parameters and providing ranges of the estimates. The distinction between what is proposed for a ranger and what is defined for a recreational user can not be made using risk assessment as the measure. This scenario should not be considered.
135.	TPR	Page 3.4, Table 3.1, col 3, next to bottom line	Should the units be mg/cm^2 ?
136.	TPR	Page 3.5, 3.2 Hunter/Fisher, para 3	Is the maximum number of days used for hunting just a rounded value picked because it is slightly less than half the total of 48 days? Or was it selected based on a review of the total number of weekend days (a logical time for hunting) available in all of the hunting season? Or was is picked from game department surveys?
137.	TPR	Page 3.5, 3.2 Hunter/Fisher	A great deal of effort was evident in this section as estimates of hunting success and hunting catches were documented. Also details on length of hunting season and hunting locations were included. Unfortunately, many of these estimates seem unreal when given as exact numbers rather than ranges. Again, as in the previous sections only intake/contact rates were given as ranges whereas all other values were single values. Sensitivity analysis or exposure modeling would aid in allowing the reader to understand if these estimates are reasonable, conservative or underestimates of true exposures. Without some additional information the reader is very uncertain how to interpret these scenarios. Are there evaluations of young hunter/fisher children? Although it might be likely that if the child's parents are avid hunters than the children might also go hunting, this was not discussed. If children are included in the scenario then how does the exposure duration of 30 years apply? If they start hunting at 12 years of age do they then stop at 42? Obviously, substantial additional discussion is needed to explain these sections.
138.	TPR	Page 3.5, 3.2 Hunter/Fisher	There is too much uncertainty associated with estimating the movement of contaminates from one media to another to provide meaningful results. This scenario should not be considered.
139.	TPR	Page 3.5, 3.2 Hunter/Fisher	Though the presentation of the numbers is confusing, it appears that the one individual hunter/fisher spends four hours per day and 120 days per year on the site. This would be for subsistence, not recreation, and that is why "....the total catch is 10 times the regional average;".... If this is correct, it might be stated explicitly.
140.	TPR	Page 3.5, 3.2 Hunter/Fisher	If the total catch of ten times the regional average is going to be used, then it will be important to avoid saying that this "overestimates exposure," but instead defend it on the basis that some people could be exposed that much.
141.	TPR	Page 3.5, 3.2 Hunter/Fisher	Why is the ingestion of soil by a hunter assumed to be only 100 mg/day while on the soil the entire day, yet this is the same estimated ingestion amount for the ranger scenario (Table 3.1) when it is assumed the ranger will be on soil only one third of the day?
142.	TPR	Page 3.6, Table 3.2, col 4	The max contact of 8 hours seems on the low side for a dedicated hunter/fisher.
143.	TPR	Page 3.6, Table 3.2, col 7, row 10	The value of 0.19 may be low for some hunters. Since this is presumably a conservative screening exercise, maybe the value should be higher.
144.	TPR	Page 3.7, bullet 4	Why does the hunter/fisher inhale 10 m^3 of air during four hours, while that is the same inhalation total for the ranger for 9 hours?

No.	Reviewer	Location	Comments
145.	TPR	Page 3.7, bullet 6	From what data base(s) is it estimated that a hunter/fisher will kill 125 ducks and pheasants in a season and only one deer?
146.	TPR	Page 3.8, bullet 4	Will the factor of 0.2 account for low water periods, when a larger area of sediments are exposed ?
147.	TPR	Page 3.9, Table 3.3, col 5	Is the exposure frequency adequately conservative? I would think many recreational visitors could spend considerably more than 7 days/year.
148.	TPR	Page 3.9, Table 3.3	Why is the estimate of total water consumed (4 L) by the recreational visitor during an 8 hour day estimated to be larger than what is estimated (3 L) for a Native American subsistence resident there for 24 hours a day?
149.	TPR	Page 3.9, Table 3.3	Why is the intake/contact rate range for soil ingestion 20-500 for a recreational visitor versus 10-150 for a Ranger (Table 3.1)? Similarly, why is the intake/contact rate range for external exposure to soil 2-12 for the recreational visitor, and 0-4 for a Ranger (Table 3.1)? Similarly, why is the intake/contact rate range 1-8 for dermal exposure to surface water and 0-4 for a ranger?
150.	TPR	Page 3.9, Table 3.3	Where is soil inhalation for the recreational visitor scenario?
151.	TPR	Page 4.1, 4.0 Native American Scenarios	The default water intake values used in the assessment of subsistence and hunter gatherers should be reconsidered and perhaps increased. Vigorous outdoor activities in an arid climate may lead to rapid water loss. Increased water intake seems very likely considering there is a relatively clean water source easily available.
152.	TPR	Page 4.1, 4.0 Native American Scenarios	This reviewer was pleased to see that tribal nation concerns were given serious evaluation in this document. This reviewer was also pleased to see that a range of possible exposure scenarios were considered. As in the early sections of this document, acknowledgment of "limited tribal information" is given; however, again there is no plan to explain how and when such information will be obtained or incorporated into future documents.
153.	TPR	Page 4.1, 4.0 Native American Scenarios	What contaminant concentrations will be used for the seep/spring water? Direct measurements or calculations based on dilution of groundwater?
154.	TPR	Page 4.1, para. 1, last sentence	Should this read: "These as well as other activities-" ?
155.	TPR	Page 4.1, para 3, last line	"---irrigation (with such water ?) would not occur"
156.	TPR	Page 4.2, issue #2	The accumulated exposure of a woman to contaminants prior to "childbearing age" can contribute to effects on infants and mothers during childbearing age. This needs to be acknowledged.

No.	Reviewer	Location	Comments
157.	TPR	Pages 4.1-4.12 4.0 Native American Scenarios	Intake factors should be calculated for each of the proposed scenarios. Estimates of the range of each intake factors should be calculated after ranges are estimated for each of the default parameters used. The goal of this process is to show the margin of error associated with each scenario. If the margin of error associated with the intake factors are such that they do not overlap, then the scenarios are reasonably distinguishable. If however, the margins of error do overlap, there is no scientifically defensible distinction between the scenarios. It is the opinion of this reviewer that the public may be misled by the suggestion that risk assessment is a science that has the capability to distinguish between a Native American scenario and any of the other scenario proposed. This point is to be emphasized when four Native American scenarios are proposed. The fore-mentioned calculations will resolve this issue.
158.	TPR	Page 4.2, issue 3	What's really being said here? Are you saying that the tribes have legal rights that cannot be safely exercised? It's not clear what you're really saying, and it sounds like avoidance.
159.	TPR	P. 4.2, last para	What is the "ultimate receptor" and what is the basis for saying it is the horse ? Also, should the next sentence read: "--as well as from gathering--" ? Also, in last sentence, rationale is misspelled. Finally, should Table 4.1 be referred to here?
160.	TPR	Page 4.2, para 6, last sentence	Subsistence Resident, last two lines. Again this document acknowledges that review and modification of the exposure scenarios is needed by tribal technical staff. More information is needed to explain when and how this information will be obtained.
161.	TPR	Page 4.2, para 6, last sentence	typo: use "rationale" not "rational"
162.	TPR	Page 4.2, last paragraph	In the middle of the paragraph, a sentence discusses "....other types of Hanford Site visits...." in the context of describing the activities of someone who lives there absolutely all the time for 70 years.
163.	TPR	Page 4.3, bullet 1	Soil Ingestion. This paragraph states that childhood years will not be separated from adult years. How does this compare with statements made on pages 6.5 and 6.6 about the two-fold application of these equations?
164.	TPR	Page 4.3, bullet 5	The text indicates that 30 m^3/day air inhalation and resuspended soil inhalation, which is said to be "150 percent of the default value", accounts "for a more active outdoor lifestyle." And yet that 30 m^3 day is for 24 hours presence, while the rancher is said to breathe 10 m^3 a day in 8 hours and fish hatchery and industrial workers are estimated to breathe 20 m^3 in 8 hours.
165.	TPR	Page 4.3, bullet 2	Soil External Radiation Exposure. This paragraph ends in a leading question. How and when will these factors be modified for gathering of root crops? Please do not let the reader leave this point without resolution.
166.	TPR	Page 4.3, bullet 3	Soil Dermal Contact. Does the document need to cite how skin absorption fractions will be added? Are these listed in HSRAM? If so, cite specifics.
167.	TPR	Page 4.3, bullet 4	Is there any basis for doubling the dust loading value for Native Americans ?

No.	Reviewer	Location	Comments
168.	TPR	Page 4.3, bullets 5 and 7, Page 4.4 , bullet 4, Table 4.1	Here and elsewhere it appears that the normal rate of air inhalation is 20 cubic meters of air per day, or possibly 30 for a more active lifestyle. Then it appears that an additional 15 cubic meters is attributed to water volatiles inhalation from seeps/springs and 15 from surface water, but this latter is split with seeps/springs. Are we talking about 30 or 45 (or possibly 60) cubic meters inhalation per day? What are the limits to human lung capacity? If volatiles are inhaled as part of normal respiration, is the 0.1L per cubic meter (Table 4.1, p. 4.6) a concentration factor that indicates this? If so, is it used to multiply 30 cubic meters or 15 or 45 cubic meters? The 15 cubic meters for volatiles from surface water and 15 cubic meters for volatiles from seeps/springs appear in many places. If they are not going to be used directly, as may be the case, why put them in? Or, at least, give some explanation in footnote e. in Table 4.1, and elsewhere. Or is this one more example of excessive conservatism that could lead to absurd results in the wrong hands? The above comment raises a general observation that it is not easy to understand some of the details of the scenarios without knowing how they will be used and combined in subsequent risk calculations. This will presumably be addressed in another document, but some introduction to the process could improve this one.
169.	TPR	Page 4.3, bullet 5	The statement that 30 m^3 / day of air inhalation being 150 percent of the default value is misleading and suggests this is an extremely conservative assumption. Using reference man values, in a 24 hour day, an individual doing light work (8 hours) with 8 hours (nonoccupational) and 8 hours resting would breath approximately 23 m^3; 30 m^3 is only 130% of that value. I would suggest either rewording the statement, reexamining the "conservative assumption" or both.
170.	TPR	Page 4.3, bullet 6	The assumption of 3 L/d of water for a subsistence resident, although greater than 2 L/d is probably an underestimate. The reference man values suggest a water balance of 3 L per day on average (from milk, fluid, tap water and other sources). An individual involved in subsistence living, outdoors in an unheated/uncooled environment may consume greater quantities of spring water to compensate for the lack of alternative drinking supplies, and to regulate body temperature.
171.	TPR	Page 4.4, bullet 1	Seep/Spring Water Dermal Contact. How did the authors decide on 1 hour/day for activities at seeps or springs? Did they consult tribal members? If so, then please cite. Similarly, how did the authors decide on 2.6 hours/day for swimming and boating activities? Were tribal members asked these questions? The value 2.6 provides a level of precision that is probably beyond the scope of this report.
172.	TPR	Page 4.4, bullet 3	On what data basis is a boat assumed to shield a person "from half of the radiation coming from the surface water"?
173.	TPR	Page 4.4, bullet 6	Food Ingestion Rates. The second line in this paragraph acknowledges that the fish consumption rate used is "likely to be well below traditional subsistence levels." Why was it chosen, given these documented values? This does not represent a "high-end" exposure. The document discusses the potential problems in using a single set of contaminant uptake factors for plant materials. Although the problem is documented, can any available information on tuber versus leafed plants be used to attempt to bring some range of values for these factors?
174.	TPR	Section 4.4, last paragraph	It is noted that food ingestion factors assume 100% of plant material ingested is of local origin and 100% of fish ingested is of local origin. Does this plant material include airborne (including rain) contaminants from Hanford operations? This should be clarified. (It was suggested to me that the values would only include contamination expected from irrigation water from the river. If this is the case, i.e., only river water contamination is being considered, the limitation should be stated and justified. If airborne contamination is not considered, the results of this risk assessment will not agree with the dose reconstruction study.)
175.	TPR	Page 4.5, top of page	The document states that "Each risk assessment application should be reviewed for the ability of fate and transport models to provide the level of detail needed for the assessment context." When will this be done? By whom? At the end of the impact assessment or for the next assessment?

No.	Reviewer	Location	Comments
176.	TPR	Page 4.5, bullet 4	What is "smudging" ?
177.	TPR	Page 4.5, para 2	Bioaccumulative substances (e.g., organochlorines) will make consideration of consumption rates of specific species or animal organs/tissues (e.g., consumption of fatty tissue) imperative.
178.	TPR	Page 4.5, para 3	Ingestion pathways for milk and for wild bird eggs need to be included in the screening-level risk assessment. If additional information is provided by the Tribes for these two ingestion pathways, then the calculations can be re-figured. You do not have good data on MANY numbers you place in these tables and scenarios. Lack of data doesn't stop you elsewhere from putting in tentative numbers (which unfortunately look like numbers base on data). Therefore, why do you avoid taking an estimate re: milk and wild bird eggs? Milk, for instance, may be a major pathway for radioactive iodine.
179.	TPR	Page 4.5, para 3	Why did the authors state that "An additional pathway that should also be considered is mothers' breast milk" yet not include this in the scenarios?
180.	TPR	Page 4.5, para 3	I agree that an additional pathway to evaluate is breast milk as breast milk can contain concentrated levels of contaminants relative to the mother's tissue or fluid levels.
181.	TPR	Page 4.5, bullet 4	Cultural Pathways. The authors are to be highly commended for including a discussion of some cultural practices. This reviewer was confused about the details of including the scenario. Will this be included? If so, will age specific factors be evaluated? Do elderly members participate more than young? Are babies included in these practices?
182.	TPR	Page 4.8, para 2	Cultural Activities Visitor. This paragraph refers to the "need to include" special collection and/or ingestion of water, plaints, or animal material but does not specifically state how and when such exposure information will be included in this impact assessment.
183.	TPR	Page 4.8, para 6	This section discusses how a range of times spent on the island is used for these analyses yet Table 4.4 did not discuss this range. Add this information to the table. This was a potentially important pathway to consider in this assessment.
184.	TPR	Page 4.8, 4.4 Columbia River Island User	It seems strange to include this section on the Columbia River Island User. First, it seems the problem is mainly particulates carrying Cobalt 60, and given its half-life there should be not much of it left in a short time, unless it is produced by activities not at Hanford. The observation that it has been found (only?) on islands and along the shore of the river suggests that its presence may be attributed to the once through cooling water systems in reactors that have long since ceased operations. Also, if these particles can be inhaled into the nose, why aren't they found elsewhere in the Site? And if they are, why can't the detailed scenario given in this section be used in other scenarios and for other isotopes besides Cobalt 60? Section 4.4 does take into account the relatively short half-life of this isotope, but still displays excessive conservatism in the last sentence on p. 4.12.
185.	TPR	Page 4.8, 4.4 Columbia River Island User	Why is this not considered a Columbia River Island and Shore User scenario, and time spent on the shore be equal to time spent on an island with regard to discrete radioactive particles?
186.	TPR	Page 4.10, Table 4.3	The three values of inhalation listed in the table are confusing in their presentation. Is the first inhalation value a subset of the soil/sediment pathway?
187.	TPR	Page 4.11, Table 4.4	The title of the table should indicate that the data are for exposure to ^{60}Co particles

No.	Reviewer	Location	Comments
188.	TPR	Page 4.11, Table 4.4	Is the soil density cited in this table a measured or an estimated value? This value seems low for many soils and sediments.
189.	TPR	Page 4.12	Good discussion of potential differences in particle size and deposition.
190.	TPR	Page 4.12	What is the range of sizes of the cobalt-60 particles? Only the "typical" size of 0.1 mm was mentioned. If the sizes of the particles range from less than 0.01 mm (respirable) to greater than 0.1 mm, the pulmonary risk needs to be addressed.
191.	TPR	Page 4.12	On what is the Durham assumption based of a nasal retention time of 1 to 2 days? If a person has an infection (e.g., cold virus), there may be macrophages active in nose and throat that phagocytize the particle and retain it in the body.
192.	TPR	Page 4.12	Phagocytosis occurs deep in the lung with the smaller particles. Therefore, it is important to understand fully the retention time assumptions for cobalt-60 and other respirable contaminated particles. An assumption that the body clears the foreign matter is not accurate. Please explain the assumptions used for smaller particles as they are not evident from the document.
193.	TPR	Pages 4.8-4.12 4.4 Columbia River Island User	Do cobalt-60 particles in the 100 micron range cause increased cancer risk to the nose, larynx, pharynx, sinuses, mouth, or stomach (if swallowed)?
194.	TPR	Page 5.1	General Population Scenarios. How does the listed rate of irrigation of 45 inches/year compare to the rates for this region of Eastern Washington? I would think these values would be better represented as a range of values.
195.	TPR	Page 5.1	Can it be assumed that no groundwater pathways are assumed because seeps would be counted as surface water as soon as it oozes to the surface (defined on page xiii)?
196.	TPR	Page 5.1	Can ground water for irrigation be ignored because no wells are used in this area for irrigation?
197.	TPR	Page 5.2, Table 5.1	2nd column of table cut off the end of the word 'showering'
198.	TPR	Page 5.2, and 5.3, Tables 5.1, 5.2	Bravo! These tables finally cited references used in these calculations.
199.	TPR	Page 5.2, Table 5.1	In the "Other Factor Definition" section for biota, the value of 0.5 is defined with reference to a footnote that does not explain the factor.
200.	TPR	Pages 5.2 and 5.3, Table 5.1 and Table 5.2	Presumably seep/spring water (Table 5.1) is the same as groundwater (Table 5.2)? Also, several places in the text (see previous comments) suggest that one or the other water source will be used but not both, as appears to be the case from these tables. The previous comments concerning inhalation of volatiles from water combined with inhalation of air also apply to these tables.
201.	TPR	Page 5.3, Table 5.2	In the "Other Factor Definition" section for biota, the value of 0.5 is defined with reference to a footnote that does not explain the factor.
202.	TPR	Page 5.3, Table 5.2	In the "Other Factor Definition" section the word footnote is misspelled.

No.	Reviewer	Location	Comments
203.	TPR	Pages 6.1-6.6, 6.0 Exposure Equations	Exposure Equations. This reviewer was extremely confused by this section. For example, on page 6.2 the first paragraph discusses application of the equation twice, once for the 0-6 year age group and once for the adult group. This is one of the few times children are discussed. Additional details are needed to understand how these different factors will be applied.
204.	TPR	Pages 6.1-6.6, 6.0 Exposure Equations	The lay reader will simply skip over this section because it's so intimidating. I don't know any way to make it less intimidating so it's probably OK to just accept that its there solely for technical people (assuming the technical people feel it makes sense).
205.	TPR	Pages 6.1-6.6, 6.0 Exposure Equations	The reliability of Human Scenarios for the Screening Assessment can best be estimated by calculating intake factors for each scenario should be determine from these equations. The intake factors should be included on a separate table and have an estimated range of associated uncertainty. This comment will be resolved by calculating intake factor for each of the proposed scenarios and estimating a range of uncertainty.
206.	TPR	Page 6.1, DF1	No mention is made of the type of dose conversion factor used in the soils calculation. Is the soil presumed to be uniformly contaminated or merely at the surface?
207.	TPR	Page 6.3, Sa_{other}	This term should be SA_{other} to be consistent with the equation.
208.	TPR	Page 6.3, 6.3 Inhalation Exposure (Non-Radioactive)	Does the mass loading of soil in air take into account gusty, windy, and other highly turbulent days? If so, how?
209.	TPR	Page 6.4, 6.4 Inhalation Exposure (Radioactive)	The term ET_{other} is defined as Et_{other} in the list.
210.	TPR	Page 6.4, 6.4 Inhalation Exposure (Radioactive)	The term EF_{other} is defined as Ef_{other} in the list.
211.	TPR	Page 6.6, 6.6 Ingestion Exposure (Radioactive)	Cmeat and Cmilk, etc. Will these values be from locally produced meat and milk, including airborne (including rain) dissemination of Hanford contaminants such as radioactive I and Sr in forage plants that local cattle would consume? If only river water contamination is being considered, the limitation should be stated and justified. The statement at the bottom of the page, "Each of the concentrations values may need to be estimated ..." leaves unclear whether measured concentrations are to be are to be compared with values calculated here. If this report will calculate vegetation concentrations derived from being irrigated with Columbia River water, and calculate cattle concentrations from eating these plants and drinking Columbia River water, (but ignore any contamination derived from past airborne releases that may be in the soil or in plants), the Scenarios may be mathematically correct, but unrelated to reality. This needs to be clarified.

No.	Reviewer	Location	COMMENTS
212.	ERC	General; page 4.1	This document is professional and culturally sensitive. The authors acknowledge that tribal peoples undertake "a variety of unique activities, some of which have no standard suburban surrogate activity in HSRAM" (p.4.1). In consultation with the Tribes, they have developed scenarios which consider traditional life ways. It is evident that the authors have heard the concerns of the Native American groups and have accommodated tribal values into their preliminary analyses. This is particularly evident in statements such as: "Informative about culture-specific practices is not required" (p. 1.3) "Fate and transport models must be examined for their ability to handle information about species-specific uptake and distribution among plant parts or animal tissues before justification exists for requesting sensitive information from tribal members" (p.4.2) The authors also note in several places that the Native American Scenarios are incomplete; that "applications other than the screening risk assessment...will require review and modification by tribal technical staff" (p.1.2) before they are routinely used for regulatory analyses. The limited applicability of these models as currently developed should be understood by any potential users. Tribal involvement is critical for the continued refinement and evolution of these models.
213.	ERC	General	A screening risk assessment is generally defined as a process by which risk is rapidly estimated, using available protective standards, criteria, and/or advisories, such as maximum contaminant levels, and preliminary remediation goals. A screening risk assessment tends to intentionally overestimate risk. The exposure factors presented in the document are intended for estimating dose. To estimate risk, the doses will have to be multiplied by cancer slope factors or divided by reference doses. That process is identical to that used in a conventional baseline risk assessment. Why is the assessment called a screening risk assessment? Is it because the exposure factors proposed for dose estimation are conservative preliminary estimates? How do we know they are conservative? To what degree could the estimates be improved and what level of effort would be required to obtain significantly better estimates? Preliminary baseline risk assessment might be a better name.
214.	ERC	Specific Exposure Factors	Industrial Worker: Exposure frequency and duration are not the same as recommended by EPA. In Risk Assessment Guidance for Superfund: Human Health Evaluation Manual Supplemental Guidance: Standard Default Factors, the recommended exposure frequency and duration to soil are 250 and 25 years for the industrial worker. The difference will have no appreciable impact on risk. It is not clear how the mass loading factor of 50 ug/m^3 was obtained. Does it represent the average PM_{10} concentration for the area? Whey is there no geometry correction for external radiation? To assume the area of skin exposed to surface water suggests that the industrial worker is assumed to swim in the river or shower with river water.
215.	ERC		Fish Hatchery Worker: Dermal adherence factor of 1 mg/cm^3 may cause dermal risk to exceed oral risk, which is not logical toxicologically.
216.	ERC		Ranger: The inhalation rate of 10 m^3/day will underestimate risk. It amounts to only 0.42 m^3/hr. The standard rate for a resting adult is 0.83 m^3/hr (20 m^3/day); therefore, for a person engaged in moderate activity, the proposed rate is low. In addition, if the desired rate is 10 m^3 per 9 hours (1.1 m^3/hr), the proposed rate is lower than the desired rate. If the desired rate is 10 m^3 per 9 hours (not unreasonable), the rate used to calculate dose should be 1.1 m^3/hr. The standard vapor inhalation dose equation is: D=(Ca x Ri ET x EF x ED)/(BW x AT)

No.	Reviewer	Location	COMMENTS
			Where: D = dose (mg/kg-day) Ca = chemical concentration in air (mg/m^3) Ri = inhalation rate (m^3/hr) ET = exposure time (hr/day) EF = exposure frequency (day/yr) ED = exposure duration (yr) BW = body weight (kg) AT = averaging time (day) The soil ingestion rate of 100 mg/day is the EPA-recommended rate for a resident adult. It is probably appropriate for a person who works mainly outdoors (ranger). Ingested soil and sediment will be treated as mutually exclusive events and 100 % of the ingested soil is assumed to be from the site. Both will tend to overestimate risk unless the dose equation contains a factor in the numerator that represents the fraction of time exposed to contaminated soil/sediment. During the 9-hour working day, the ranger will be exposed 3 hours each to contaminated soil and sediment. The rest of the day, the ranger will be on the water. The exposure factor should, therefore, be 0.33 (3 hr/9 hr) for soil and the same for sediment. [Note: the soil ingestion dose equation does not contain an exposure time factor, so if the exposure time to contaminated soil is less than 24 hours per day (as with the resident), the suggestion exposure factor is needed to prevent overestimation of risk]. Please explain why sediment adherence factor for the ranger is 0.2 mg/cm^2, and the soil adherence factor for the hatchery worker is 1 mg/cm^2. Wouldn't both be handling wet or moist soil? Note caution mentioned above about using soil adherence factors of 1 mg/cm^2 or more.
217.	ERC		Hunter/Fisher: As with the ranger, the inhalation rate of 10 m^3/day is too low. The rate should be 2.5 m^3/hr, which is EPA's estimate of the breathing rate associated with moderate activity in an adult. See above comment on sediment adherence factor.
218.	ERC		Recreational Visitor: Please explain in the text the logic behind assuming whole body (20,000 cm^2) exposure to spring and surface water. The dermal exposure time of 2.6 hours for surface water suggests swimmings; however, the dermal exposure time of 0.17 hr (about 10 minutes) for spring water provides no clue.

<table>
<tr><th>No.</th><th>Reviewer</th><th>Location</th><th>COMMENTS</th></tr>
<tr><td>219.</td><td>ERC</td><td></td><td>Subsistence Resident (Native American Scenario): Some of the exposure factors are more conservative for Native Americans than for Non-Native Americans. Some instances of higher conservatism are listed below. The reason for the higher inhalation rate was given in the report. Please explain others.
<table>
<tr><th>Parameter</th><th>Non-Native American</th><th>Native American</th></tr>
<tr><td>Soil adherence factor</td><td>0.2 mg/cm^2</td><td>1 mg/cm^2</td></tr>
<tr><td>Soil ingestion rate (adults)</td><td>100 mg/day</td><td>200 mg/day</td></tr>
<tr><td>Inhalation rate (adults)</td><td>30 m^3/day</td><td>20 m^3/day</td></tr>
<tr><td>Water intake rate (adults)</td><td>3 L/day</td><td>2 L/day</td></tr>
</table>
The proposed indoor inhalation rate of volatiles released from seep/spring water is 15 m^3/day, which is reasonable. Some of the volatiles will be from spring water and some will be from surface water, both used in the home. A statement is made that vapor inhalation also occurs when swimming and the inhalation rate while swimming appears to be 15 m^3/day. A statement is also made that because of the active life-style of a Native American, the outdoor inhalation rate is 30 m^3/day?

Please explain what the other factor, 0.1 L/m^3, is. The footnote explanation is inadequate.</td></tr>
<tr><td>220.</td><td>ERC</td><td></td><td>References are made throughout the document to future reports that DOE/PNNL will produce or are "in preparation." Referring to these future documents is confusing and does not add anything to the current report. Recommend deleting these references.</td></tr>
<tr><td>221.</td><td>ERC</td><td></td><td>Many of the exposures, especially the Native American scenarios, are 1.5 or 10 times the magnitude of a typical scenario. This seems excessive and will likely add greatly to the uncertainty associated with the predicted site risks. In other words, risks will be over estimated.</td></tr>
<tr><td>222.</td><td>ERC</td><td></td><td>The report is well organized and easy to follow. The range of human exposure scenarios provides good coverage of the potential scenarios that my occur in the area, and is certainly adequate for the screening assessment.</td></tr>
<tr><td>223.</td><td>ERC</td><td>Page vi, third paragraph</td><td>The screening assessment, as described, is similar to what was done during the limited field investigations for each operable unit (which formed the basis for the IRM). The method to calculate risk that is proposed here is much more rigorous, however. Suggest adding text to show how this goes beyond the QRA and LFI activities.</td></tr>
<tr><td>224.</td><td>ERC</td><td>Page vii, first line</td><td>It is not clear what "essential work remaining" means. Please clarify the sentence. Abundant description of data gaps and tasks necessary to conduct a comprehensive risk assessment are presented in DOE/RL-92-28 and Appendix D to each Operable Unit work plan. Somehow modify this short-term objective to show that we are not "re-inventing the wheel;" show what is new compared to previous proposals already presented to the public (ref. TPA M-30 series of milestones).</td></tr>
<tr><td>225.</td><td>ERC</td><td>Page vii, second section</td><td>"Media," "external radiation" is not considered a "media;" clarify whether "surface soils" or other physical media is meant that would provide an external radiation dose.</td></tr>
</table>

No.	Reviewer	Location	COMMENTS
226.	ERC	Page vii, third section, second paragraph, first sentence	Add "could potentially" affect the Columbia River. We don't know yet if the Columbia River is affected.
227.	ERC	Page vii, third section, second paragraph, second sentence	Suggest you change "winnowing" to "decision;" it's a more accurate/scientific term for the process used.
228.	ERC	Page vii, third section second paragraph, last sentence	This sentence is confusing. Clarify what is meant by "comments" and from whom they were received. Provide a citation for the draft referred to. Suggest you delete "in the draft" from the second-to-last line.
229.	ERC	Page viii, second paragraph	Suggest deleting this paragraph because it adds little to clarify what is presented in this document.
230.	ERC	Page ix, third paragraph, fifth line	"Assessment of current impacts" could imply evaluating current levels of contamination, or current exposure conditions (scenarios), or both. This should be clarified.
231.	ERC	Page xi, Glossary	The definitions given could be improved in several cases. For example: a) Bioaccumulation - The definition does not say what tends to occur at higher concentrations. b) 100 Areas - The definition does not reflect that there are six reactor areas along the Columbia River, and there are considerable expanses of undisturbed areas between these reactor areas. c) Bioconcentration factor - This definition is specific to aquatic organisms only, and for radionuclides only. The definition should be revised so it is applicable for contaminants in general and to aquatic, riparian, or terrestrial organisms. d) Carcinogenic - Applies to radionuclides as well as to chemicals, suggest deleting the word "chemicals." e) Deterministic - The definitions and distinction between "deterministic" and "stochastic" are not clear. Also, for comparison, add definition for "probabilistic." These terms are difficult for the non-statistician. f) Reactor - A reactor is a physical structure while production operations are activities. The definitions should be different. g) Screening assessment of risk - Towards the end of the definition it refers to "areas." It is not clear whether "area" means a location, or a particular exposure scenario, or both of these and maybe more. h) Seeps - "oozes" is not a very good technical term.
232.	ERC	Page 1.1, Section 1.1, first paragraph, second sentence	It is noted that "only two" HSRAM scenarios are available for current Hanford conditions. In fact, four HSRAM scenarios are presented; the residential and agricultural scenarios, and the unmodified industrial and recreational scenarios.
233.	ERC	Page 1.1 Section 1.1, first paragraph	Suggest the paragraph start with the fourth sentence, "Numerous proposals...." The first sentence could be inserted as the next to the last sentence, and the second and third sentences could be deleted.
234.	ERC	Page 1.1, Section 1.1, first paragraph, ninth line	After the phrase "assessment of potential" add the following, "...impacts due to current levels of contamination in media associated with the Columbia River...."

No.	Reviewer	Location	COMMENTS
235.	ERC	Page 1.2, Section 1.2, first paragraph	Clarify the meaning of "high-end" exposure.
236.	ERC	Page 1.2, Section 1.2 second paragraph	The ranger, and the recreational visitor, may also consume biota.
237.	ERC	Page 1.3, Section 1.2.1, first paragraph, third sentence	It is not clear what is meant by "cultural media." An example of a cultural media would be helpful.
238.	ERC	Page 1.3, Section 1.2.2	Suggest you exchange the sequence of the last two paragraphs.
239.	ERC	Page 1.4, Section 1.4, last bullet	Could the same be true for the other scenarios?
240.	ERC	Page 2.1, Section 2.1, second line	Revise "...pathways are activated." and "The specified factors" to "...pathways are included." "The exposure factors."
241.	ERC	Page 2.1, Section 2.2, last paragraph and page 2.3, Table 2.2	It is not clear what the rationale is for adding 10 years to the fish hatchery worker exposure duration.
242.	ERC	Page 2.4	The titles could be revised to emphasize that one section covers exposure to soil, one to air, one to groundwater, etc.
243.	ERC	Page 2.4, third paragraph, last line	The relationship of reduced body surface to HSRAM or this study is unclear.
244.	ERC	Page 3.1, fourth paragraph, sixth line	The term "significant features" is too vague.
245.	ERC	Page 3.2, Section 3.0, second set of bullets	"Sport fishing" would likely be considered to be a sub-set of "flatwater recreation."
246.	ERC	Page 3.3 fourth and fifth bullets	For the Hanford Site, the contaminants are primarily or exclusively on the airborne particulates. Are two separate intake pathways necessary?
247.	ERC	Page 3.3, Section 3.1, first bullet, last word	The use of the word "site" in this sentence is confusing, suggest using a more definitive word. See also the Sediment Ingestion bullet; the amount of time spent ingesting soil and sediment is not clear with reference to three hours each. Please clarify.
248.	ERC	Page 3.3, Section 3.1, third bullet	Please clarify which 5,000 sq. cm. of skin (e.g., hands, arms, face etc.) is referenced.
249.	ERC	Page 3.3, Section 3.1, fifth bullet	Suggest correcting the intake to equal the percent of 24 hours exposed (9/24 x 20 cu. meters/day = 7.5 cu. meters) OR add language to this section like that in the Native American scenarios attributing the extra air to a "more active outdoor lifestyle."

No.	Reviewer	Location	COMMENTS
250.	ERC	Page 3.5, Section 3.2	The cumulative time spent hunting and fishing seems excessive. The hunting/fishing time exceeds the time most individuals would have available for all their recreational activities, and exceed most individuals vacation time. If hunting/fishing is assumed to be the primary activity for the individual, then this should be clearly stated.
251.	ERC	Page 3.7, Section 3.2, third bullet	See comment #15. Air inhaled could be on the order of 3.3 cubic meters.
252.	ERC	Page 3.7, Section 3.2, last three bullet	To be consistent it seems like the upland game bird and waterfowl ingestion should have a "hunter success rate" attached as in the deer ingestion (19% success rate). Another alternative would be to assume that the hunter gets a deer ever year.
253.	ERC	Page 3.8, Section 3.2, second bullet	Add "fishing" to this exposure pathway.
254.	ERC	Page 4.1, last paragraph, fourth line	Clarify the meaning of "seep/spring water ingestion is included in the river water ingestion." The contaminant concentrations in these two bodies of water are expected to be very different.
255.	ERC	Page 4.2, Section 4.0, first issue, last sentence	Clarify the reference to "the other three scenarios." Do you mean the ranger, hunter/fisher, and recreational visitor?
256.	ERC	Page 4.2, Section 4.1, first paragraph, sixth sentence	This seep/spring access assumption is not reasonable. These seeps/springs are under water much of the time and not accessible, especially at the volumes needed for some of the exposure assumptions outlined in the "water ingestion" and water inhalation" bullets in this section.
257.	ERC	Page 4.3, Section 4.1, most of the bullets	Almost all the bullets on this page refer to "factors," "reviews," or "alterations" that might be made to the exposure pathways. Explain when (if ever) these changes will be made and who (peer reviewers, regulatory agencies, Tribes) will decide the changes are necessary. As they stand, these pathways are wide open for interpretation.
258.	ERC	Page 4.3, Seep/Spring water ingestion	See comment #35.
259.	ERC	Page 4.4, Surface water ingestion	Give examples of what constitutes "surface water" (e.g., Columbia River water, ponds, or collected rainwater). Data are available only for Columbia River water, so it may be better to just say river water rather than just surface water.
260.	ERC	Page 4.4, bullets on Surface Water External Radiation Exposure and Surface Water (Swimming) Dermal Contact	Explain whether allowances are made to account for part of the 2.6 hours being spent in the boat and part of the time in the water.
261.	ERC	Page 4.4, Section 4.1, last bullet	Please clarify the fish consumption rate. It is uncertain if 270 or 540 g/day is correct. The table presents 540.
262.	ERC	Page 4.5, Section 4.1, second full paragraph	See comment #36.
263.	ERC	Page 4.5, Section 4.1, last bullet	Remaining in a 180°F degree area for an hour does not seem reasonable.

No.	Reviewer	Location	COMMENTS
264.	ERC	Page 4.12, Section 4.4, last paragraph	It might be helpful to some reviewers to provide an example of how large a 100 micron particle is in relation to a common element such as a grain of sand.
265.	EPA	Page v, last paragraph	Most of this paragraph is meaningless to our target audience. It is full of Tri-Party Agreement jargon (e.g. Change Order number M-13-93-06, milestones, changing milestone numbers, target dates). I would suggest removal of all but the first sentence of this paragraph. Note also that the preceding paragraphs also contain legal-techno jargon that is not necessary to the message of this document, and would benefit by a rewrite.
266.	EPA	Page vi - vii,	As in both the Human Scenarios and Species documents, the preface for the Phase I final document has been included to assist the reader in understanding the context of this particular document relative to the full screening assessment. Within the CRCIA management team we are giving the objectives portion of this preface an overhaul, so EPA will address our concerns with this portion in that forum.
267.	EPA	Page ix	This first paragraph of the summary, regarding definition of the initial phase, is also being resolved through the CRCIA Team, so we will address our comments on this via that forum.
268.	EPA	General	Throughout this document there is inconsistent usage of the definite article for "CRCIA" and "the CRCIA". For example, usage of "CRCIA" on page vi proceeds as: "of CRCIA have", "concerning CRCIA.", "of the CRCIA team", "on the CRCIA work", "of CRCIA", "to the CRCIA", "by the CRCIA Team". Usage should be consistent. Note also that "Team" is variously capitalized and not -- it should also be consistent. Clearly, this consistency should be applied to all the project documents.
269.	EPA	Pages xi to xiii	Laws such as CERCLA and RCRA are periodically revised, and are applied as revised, not as per the original statute. This concept could be easily captured in the glossary such as "CERCLA Comprehensive...Act of 1980, as amended".
270.	EPA	Page 1.1, 5th line	The document states "...that the impact of contaminants in the river on human health can be assessed". Note that because contaminants in groundwater/springs/seeps/soil/plants/animals/air etc in the general proximity of the river are evaluated for potential impact to human health, "in the river" would be better stated as, for example, "in or near the river", "in the river corridor", or "generally associated with the river".
271.	EPA	Page 1.1, recreational visitor	The extreme non-conservative nature of the recreational scenario in HSRAM needs to be noted. It provides for 56 hours per year of exposure. The DOE's own Intruder scenario (trespassing over fences, evading site security etc.) evaluates exposure at 100 hours per year. For areas actually open to the public (the entire Hanford Reach and downstream) this is not a valid index for recreational use. Also, the anticipated release of land by DOE to other uses, potentially including specific designation for recreational use, causes the HSRAM scenario to become even less meaningful. The main danger of this scenario is its deceptive title. It is better titled "limited-duration recreational scenario". Use of this title would reduce the possibility of misleading the reader. Note that to date both EPA and Ecology have not used the HSRAM Recreational Scenario as the basis for cleanup levels in any of our Hanford cleanup decisions. The EPA and the Washington State Department of Health advocated a more reasonable scenario when reviewing the draft revision 3 to HSRAM, and EPA and Ecology have not approved revision 3 of HSRAM. The exposure pathway analysis used in the limited-duration recreational scenario provides an appropriate starting point to define the "river-focused recreational visitor" scenario used in this CRCIA document. The limited duration of this scenario is the item of concern and it can be dealt by: (1) changing the name to "limited-duration..." or (2) changing the number of hours/days to something more reasonable.

No.	Reviewer	Location	COMMENTS
			The authors appear to be aware of this issue already because on the bottom of page 3.8 it states "If the Hanford Reach is designated wild and scenic, the access to and use of the Reach would likely increase somewhat, and the 7 days/year exposure frequency for visitors might need to be increased".
272.	EPA	Page 3.2, 1st paragraph	The 1994 National Park service document identified seven resources of the Hanford Reach which are nationally important by virtue of their rarity or exceptional quality: • Fall Chinook Salmon • Intact Ecosystem • American Indian Cultural Resources • Archeological Sites • Hydrology and Geology (for Energy Facility Siting) • Federally Recognized Rare Plant Species • Federally Recognized Rare Animal Species This CRCIA document has rephrased those seven resources to the following five resources: • archaeologic artifacts of many indigenous cultures preserved along the river • fall chinook salmon and their spawning and rearing habitat • federally recognized threatened or endangered plant and animal species • hydrology and geology suitable for siting of nuclear reactors and radioactive wastes • intact ecosystem of the river and its adjacent land north to the ridgetop (Wahluke Slope) Rewriting information from a cited reference is dangerous due to the risk of changing the meaning. That has happened. Most notably, the National Park Service document did not state, nor imply that the hydrology and geology of the Hanford Reach is suitable for radioactive wastes. By everyone's measure, radioactive wastes along the Hanford Reach is not a good idea. Additionally the National Park Service's document did not limit the description of federally recognized rare species to threatened and endangered species, as did the rewrite. Volume 1, page 106 of the NPS document discusses federal candidate, sensitive, threatened, and endangered species. As a third example of the errors introduced in the rewrite, the NPS document discusses the archaeological sites inclusive of Euroamerican pioneers, whereas the CRCIA document's rewrite limits archaeological artifacts to those of the indigenous cultures. We suggest the authors more closely follow the original documents, and where re-write is necessary to fit the format of the CRCIA document, that it is done with extreme care.

No.	Reviewer	Location	COMMENTS
273.	EPA	Page 3.3, 2nd paragraph	The ranger scenario is stated to be very similar to the HSRAM industrial scenario except that less time is spent on site. The EPA would also suggest that the ranger may spend most of his/her time outside, increasing exposure in numerous ways.
274.	EPA	Page 3.3, 2nd bullet	The following change would provide more clarity: "The daily exposure period at each location type is set to 3 hours...".
275.	EPA	Page 3.3, 4th bullet and general comment.	Note that there are generally conservative and non-conservative aspects to the general approach of these risk assessment scenarios. Similarly, there are conservative and non-conservative aspects of a scenario applied to actual individuals' life style. For example, regarding resuspended soil inhalation, the document states "The pollutant concentration in the particulate matter in air is assumed to be the same as the pollutant concentration in soil." This is a very non-conservative statement. It is common knowledge that most contaminants tend to adhere to the finer particles more than the more coarse particles. Also the finer particles are more apt to be air borne. Thus the air borne portion would be expected to be substantially more contaminated than bulk soils. In several places the document states that the deterministic calculation is for a maximally exposed individual. This needs to be changed to the reasonably maximum exposed individual.
276.	EPA	General comment on tables	Most of the values provided in the tables are easily traced to narrative in the document or standard risk assessment guidance. However, the ranges provided in the tables that will be used in the stochastic calculations generally are not referenced or explained. Their basis needs to be provided.
277.	EPA	Chapter 4.0	The EPA is glad to see the extensive effort put forth to try to portray Native American Scenarios. We appreciate that this is a poorly developed area of risk assessment and was not an easy task to assemble.
278.	EPA	Page 4.8, 1st paragraph	In the description of the hunter/gatherer, it states that "no direct seep/spring water access is assumed." The EPA would consider the hunter/gatherer is just as likely to ingest seep/spring water as the recreational visitor. The recreational visitor is assumed to ingest 2 liters per day, and this would be an appropriate value to use for the hunter/gatherer as well.
279.	EPA	Page 4.8, section 4.4, 1st sentence	Following the vent pipe removal on D-Island that occurred on October 19, 1993, there was a discrete particle survey of the upstream half of this island. Reference to the data from that survey would be a valuable addition to the Sula 1980 reference.
280.	EPA	Page 4.8, last sentence	The document states "the total skin area of 15,000 cm^2". We believe this should be 20,000 cm^2.
281.	Nez Perce	General	This is a general criticism of the "Human Scenarios for the Screening Assessment" document. Regardless of intent, the document's writers seem to assume that the cutoff values used as a "basis for estimating the potential range of risk to human health from Hanford-derived...contaminants" are fixed and/or static. The effects of exposure to extremely high levels of radiation or toxic chemicals are well know, for human health damage of death. However, a determination of cutoff values to be used to designate an expected occurrence of human health damage is less straightforward. At the very least, cutoff values are a function of genetic factors and the multiple factors which determine the quality of the exposure. The process of developing cutoff values is also dynamic; a matter of the on-going process of information gathering a human health assessment. At present, there are several government agencies with a great amount of experience in these areas, the EPA, CDC and ATSDR.

No.	Reviewer	Location	COMMENTS
			Though the cleanup of the Columbia River may be currently the purview of and/or result from the "joint activity of three government agencies: DOE, EPA, and the Washington State Department of Ecology," it would seem reasonable that all government agencies who determine human health risk (EPA, CDC, and ATSDR) should be involved in this process. Yet, only the EPA currently collaborates in this project. In sum, the assessment of human health risk is necessarily driven by the continual feedback from those on-going health evaluations being carried out by the various governmental agencies and private facilities. The human health impacts resulting from Hanford Site operations are likely to be complex and probably multi-generational. These human health risks will be fully identified only through the use of themost current epidemiological methods. The CDC and ATSDR have considerable expertise int he use of those methods. Their expertise might also be profitably brought to bear in establishing the range of exposure cutoff values.
282.	WDOH	General	In light of the conservative nature of the screening models, it would seem prudent to include possible cross effects such as industrial workers who also hunt and fish.
283.	WDOH	General	For many of the data sets, the distribution of the information is known or can be reasonably inferred. Displaying a probability distribution function with the final dose values would give individuals an opportunity to observe the relationship between the likely dose and the default parameter calculated dose.
284.	WDOH	General	It is the Washington State Department of Health's understanding that the HSRAM scenarios were included in their entirety regardless of the actual parameters used. This fact should be made clear in the document. An example of this is the residential scenarios for both Native Americans and the general population, they appear to include a 24 hr/day basis for exposure in the riparian zone. Direct exposure from soils/sediments in this zone, for example, could not occur 24 hrs/day for an entire year.
285.	WDOH	General	The inhalation rate for several scenarios appears to be very conservative. ICRP 66 estimates the range of volume breathed for an industrial worker as 9.6 to 13.5 m^3/work day (ICRP 66, 1993). Similarly, the EPA estimates a reasonable upper bound for occupational activities as 20 m^3/per 8 hr day (EPA, 1991). the Department recommends adjusting the range and most likely values to accurately reflect this information.
286.	WDOH	General	The HSRAM recreational visitor scenario assumes an exposure duration of only 56 hours/yr. This value does not appear conservative. The Department recommends increasing the exposure frequency to reflect the potential higher exposure time for individuals fishing on the river.
287.	WDOH	General	It has been the experience of the Department of Health that particles on D-Island and elsewhere have been buried distances anywhere from 2 to 15 cm (Sula, 1980, DOH forthcoming D-Island survey report). The shielded afforded by the rocks/sediment is significant and should not be included to avoid unnecessary conservatism in the calculations.
288.	WDOH	Table 4.4	In Table 4.4, the dose of conversion factor of 3.77 rem/pCi appears high. The value should be investigated to ensure its reasonableness.
289.	LEI	General	The objective of the document is to provide human scenarios for the screening assessment of risk. The screening assessment is limited to current conditions, the area between Priest Rapids and McNary Dams, selected contaminants, data, and species. In general, the set of scenarios are for current situations; however, more references need to be provided for any of the assumptions. This is particularly true for those in Sections 3.1 and 3.2. Also, little discussion exists in this document about uncertainty. Interpretation of the results of the screening assessment would be greatly improved if the level of certainty surrounding some of the assumptions were addressed. Some of this has been evaluated in the past for HSRAM assumptions.

No.	Reviewer	Location	COMMENTS
290.	LEI	Section 1.2, third paragraph, first sentence	This sentence is a contradiction as written. HSRAM scenarios are based on standard default assumptions of EPA and the Washington State Department of Ecology. There is little "realistic" about them. For example, the Industrial Worker Scenario is directly from the HSRAM. Some current workers spend more time in the field than the HSRAM standard worker. Also, this effort is meant to represent current conditions, does that not mean that worker would be exposed to more than residual contamination?
291.	LEI	Section 1.2.1, Pathways	A definition of "cultural media" would be helpful.
292.	LEI	Section 2.0, page 2.1	When describing HSRAM standard scenarios it should be mentioned that the assumption are from either the EPA, MTCA, or a combination of the two. This is important for the general public to understand.
293.	LEI	Section 2.0, page 2.1	The K-Area Fish Hatchery/Native American activity may be a good example of an exclusive scenario. Consider using this in your discussion of exclusive scenarios.
294.	LEI	Section 4.0, page 4.4	The food ingestion rate is considered to be 100%, what portion of the contaminant taken in js available to the receptor?
295.	LEI	Tables 3.2 and 3.3	Ingestion of surface water is considered for the Recreational Visitor but not the Hunter/Fisher. Can this be explained?
296.	PID	General	Skin surface area is listed as 5000 cm^2 and 20,000 cm^2 in tables. References for these values would be appropriate and distinction between these two values should be made clear. If 5000 cm^2 refers to the surface areas of both lower legs and hands for contact surface area for fishers, the value is a bit high because the area recommend by EPA is normally about 2,800 cm^2. (See Table 3.2 for example). Also in Table 3.2, duration of air inhalation exposure for fishing needs to be specified. In examining other exposure pathways such as sediment from wading (I guess), this exposure duration appears to be 4 hours per event, but this is not given for "air" inhalation. If the total body skin area is 20,000 cm^2, the range give on Page 4.8 should include this range rather than being 5000 - 15,000 cm^2. If there is reason for this discrepancy, it needs to be explained.
297.	PID	General	There some swimmers in the Columbia River in the summer time. Would the Recreational Visitor Scenario in Table 3.3 include the Simmer scenario? If not, exposure factors for swimmers need to be developed. If Table 3.3 includes swimmers, the surface water ingestion rate of 2 L/day during swimming appears a little bit on the high side.
298.	PID	General	Particle density values on in the first paragraph of Page 4.11 do not make sense. For example, it is not clear what $5x10^{-8}$ particles per m^3 means. Do you have to make a calculation to get some feel for the volume of water required to contain one particle?
299.	Ecology	vi, para 2	This paragraph is inaccurate and needs to replaced for the following reasons: 1. It misrepresents the status referenced "team charter." A team charter does not exist. The referenced given is only to a proposed draft charter which was never finalized and approved by the CRCIA Team. 2. It misrepresents the intent of the "team charter." The proposed team charter was not intended to reflect the current long-term objectives of the CRCIA reflected in the more recent TPA Change Order M-15-95-09. Rather it reflected the limited (near-term, current condition) objectives reflected in the outdated M-13-93-06 and M-15-93-09 TPA Change Orders. This entire section on objectives needs to be revised and reviewed by the CRCIA Team.

No.	Reviewer	Location	COMMENTS
300.	Ecology	xi	The definition for bioaccumulation should include exposure by all routes (e.g., uptake of contaminants by gill and epithelial tissue), not solely dietary.
301.	Ecology	xi	The definition for bioconcentration factor (BCF) should add "chemical concentration," in addition to radionuclide concentration. Also indicate that BCF is measured under steady state conditions.
302.	Ecology	xii	The definition for deterministic value (i.e., "natural random variation of a measured quantity around a central value") appears incorrect. The definition for stochastic variability has apparently been incorrectly inserted here. The illustration used does not accurately portray the meaning of a deterministic value. A deterministic value does redefine a tall person as representing average height. A definition of the deterministic value might be better represented as the "reasonably maximum height," that can be expected for a group of individuals utilizing a given doorway. If the average height of a group of people is 5'10", a doorway would not typically built only to accommodate those 5'10" or less. Rather it would be built to accommodate most individuals taller than the average height.
303.	Ecology	xii	Include a definition for Dose.
304.	Ecology	xii	The definition for hazardous chemicals indicates that this term is generally used to differentiate from carcinogenic chemicals. This is arguably not true and serves only to confuse terminology (e.g., "hazardous waste" may include carcinogens).
305.	Ecology	xiii	The definition of screening assessment is generally good. Consider changing the last line to read, "where greatest potential exists for adverse effects."
306.	Ecology	xiii	The definition for sensitivity analysis should be amended to state that it is a method to examine the variation in model output resulting from systematic changes to individual model inputs. Sensitivity analysis is most often defined as one component of uncertainty analysis. Another component of uncertainty analysis is probability analysis (e.g., Monte Carlo simulation).
307.	Ecology	xiv	The definition for uncertainty should state that uncertainty is a lack of precise knowledge as to what the truth is, whether qualitative or quantitative. This should be distinguished from variability. Variability, in turn, should be defined separately as a measure of heterogeneity or data dispersion. Variability describes the scatter of measurements around the center of a distribution (e.g., range, variance). It is recognized in practice, however, that it is often difficult to treat uncertainty and variability separately.
308.	Ecology	1.2, para 3	The first sentence is misleading in representing the intent of the screening assessment. It should not be an overestimate of exposure. Rather the deterministic value should accurately reflect the "reasonable" higher end of the exposure range. The scenarios should accurately reflect the reasonable maximally exposed individuals. The second sentence requires clarification. This sentence should read, "would consume biota from the Site."

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309.	Ecology	1.3, para 3	The description of potentially exclusive pathways can also be described by stating that exposure to contaminants from multiple sources (e.g., soil and sediment) via the same pathway (e.g., inhalation) is constrained by limitations imposed by physiological and physical properties influencing that pathway (e.g., inhalation rate and mass loading or volatilization factors are limited in magnitude). Note grammatical error in sentence 5.
310.	Ecology	1.4, para 3	Describe more clearly that both deterministic and stochastic analyses will be conducted. Also clarify that the "resulting sensitivity and uncertainty analyses" will appear in a separate report (as stated on page ix).
311.	Ecology	1.4, para 3	The deterministic value should not be an "overestimate" contaminant exposure. Rather the deterministic value should accurately reflect the "reasonable" higher end of the exposure range. The scenarios should accurately reflect the reasonably maximum exposed individuals.
312.	Ecology	2.1, para 3	Although it is stated that the HSRAM industrial scenario is included without modification, there appears to be modification. For example, HSRAM specifies inhalation for surface water but does not specify external radiation exposure from surface water. Table 2.1 specifies the opposite.
313.	Ecology	2.4 para 1	Define or describe "minimal shielding."
314.	Ecology	3.1, para 1	Suggest changing the word "ecologies" to "ecosystems."
315.	Ecology	3.1, para 2, 3rd bullet	Suggest either the word "hunter" or including the word "bird" in bullet.
316.	Ecology	3.1, para 3	Recreational uses include hunting and fishing too. Please include these activities in the first sentence of the paragraph.
317.	Ecology	3.1, para 5	Paragraph should include a definition for recreational wild and scenic scenario. The Act defines it as "Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past." This is the proposed designation for the Hanford Reach.
318.	Ecology	3.2, para 5	Last sentence of the page. recreational scenario is not similar to the hunter/fisher. Please refer to comments on recreational scenario.
319.	Ecology	3.4	The units for contact rate for dermal sediment should be mg/cm^2, not mg^2.
320.	Ecology	3.5, general Hunter/Fisher Scenario	The author needs to elaborate more on the fishing portion of the scenario, i.e. while fishing s/he fishes x number of hours for crayfish, bullfrogs, salmon, steelhead, sturgeon and smallmouth bass. Please include the species crayfish and bullfrog in the scenario. WDFW has a season on bullfrogs . Crayfish have an open season (year round) for personal use, limit of 10 pounds/day and 2 pots.
321.	Ecology	3.5, para 4	last sentence. Suggest changing the word "browse" to the word "forage".
322.	Ecology	3.5, para 4	The hunter/fisher scenario fails to discuss how many x hours the fisher spends fishing along with a list of species which should include bullfrog and crayfish as well.
323.	Ecology	3.5, para 4	Second sentence. Suggest including the word "amphibians" after the word "deer".
324.	Ecology	3.5, para 5	Hunting scenario should include morning doves as a migratory species and quail as a upland species.

No.	Reviewer	Location	COMMENTS
325.	Ecology	General Hunter/Fisher Scenario	Please extend the number of days of exposure for bird hunting since the quail season runs longer than the pheasant season and the dove season starts and ends before the pheasant season.
326.	Ecology	3.6, Table 3.2	Intake/contact rate: four hours seems extremely low for an avid hunter/fisher. I spend more than 4 hours hunting for upland species/day and almost all day/day when flyfishing. Please increase the number of hours the hunter/fisher spends on site.
327.	Ecology	3.7, bullets 1,3,4,5	Again, 4 hours seems low.
328.	Ecology	3.7, bullet 6	HSRAM lists 1 g/day for game ingestion in various scenarios for the same 45 kg deer/family/yr assumed by Paustenbach (1989). So, where does 15 g/day come from?
329.	Ecology	3.7, bullet 6	The deer ingestion rate used is actually becomes 3 grams/day rather than 15 grams/day once the 19% success rate is incorporated and only one hunter per family of four is assumed. The 3 gram/day value should be clearly stated in this paragraph.
330.	Ecology	3.7, 7th bullet	Should include information on quail too.
331.	Ecology	3.7, 7th bullet	Suggest deleting the word "and" after the word hunter, first line.
332.	Ecology	3.7, 8th bullet	Should include information on doves too.
333.	Ecology	3.7, 8th bullet	Suggest deleting the word "and" after hunter, first line.
334.	Ecology	3.8, para 5	Please include the following activities under the recreational scenario: water skiing and swimming.
335.	Ecology	3.8, para 6,7	The 7 days/year exposure is only a 56 hour/year exposure. This is low for local recreational users.
336.	Ecology	3.8, para 6,7	The State of Washington (WDFW) believes the exposure for the recreational visitor is extremely low, especially for a person or family who is involved in all the activities cited in HSRAM i.e. hunting, fishing, boating, water skiing, and swimming. The exposure would be underestimated for someone from local surrounding communities.
337.	Ecology	3.8, para 7	Under recreational scenario in HSRAM activities include "hunting, fishing boating, water skiing and swimming". The inclusion of water skiing and swimming would differentiate this scenario from the hunter/fisher scenario.
338.	Ecology	4.4, para 6	The fish consumption rate of 540 g wet wt/day seems high. For example, assuming salmon is roughly 20% protein of wet wt, this would yield 108 g protein/day which is approximately 1.9 times the recommended dietary allowance (RDA) for protein intake for adult males. While the RDA values may not be fully applicable for a tribal subsistence resident scenario, a re-evaluation of the consumption rates for protein may be in order.
339.	Ecology	4.5, para 2	Similarly, the "animal protein" intake appears high if it is in addition to the fish intake. The 150 g animal protein wet wt is equivalent to 50 g protein dry wt, assuming the 3:1 wet:dry ratio. Therefore, the sum of fish protein and "animal protein" is about 158 g protein/day which represents about 2.8 times the protein RDA for adult males. Again, while the RDA values may not be fully applicable for a tribal subsistence resident scenario, a re-evaluation of the consumption rates for protein may be in order.

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340.	Ecology	4.5, para 3	As mentioned, exposure to nursing infants from mother's breast milk is potentially significant. The lactation pathway should be included in the screening assessment, since lipid soluble substances may compartmentalize into milk and infants represent a sensitive subpopulation.
341.	Ecology	4.7, footnote e	Explain the Andelman (1990) footnote in greater detail here and in other appearances.
342.	Ecology	4.7, footnote j	"Animal protein" is a misnomer if it includes fat. Is the fat a significant portion of the 150 g?
343.	Ecology	4.9	Inhalation rate for air and soil should be 30 m^3/day, not only for consistency with the Native American Subsistence Resident scenario (Table 4.1) but also since the hunter/gatherer is presumably more active than the average resident.
344.	Ecology	4.9	"Game" has been substituted for "animal protein," although it is presumably the same thing. Is it? Be consistent in terminology.
345.	Ecology	4.10	Why is the soil/sediment inhalation rate 10 m^3/day rather than 20 m^3/day, as for air inhalation? Why are soil and sediment combined in this table? Why is cultural inhalation rate expressed as 1 hr as opposed to m^3/day? Again, there should be consistency in terminology, format, etc. where possible.
346.	Ecology	4.10	A horizontal line segment is inappropriately drawn at the bottom of the sediment/soil box.
347.	Ecology	4.11, Table 4.4	According to EPA's 1995 Health Effects Assessment Summary Tables (HEAST), the ingestion slope factor for cobalt-60 is 1.89E-11 risk/pCi, not 6.73E-6 risk/pCi. You should also include the external exposure slope factor for cobalt-60 (9.76E-6 risk/yr per pCi/g soil), since this is used in your external exposure equation.
348.	Ecology	4.11, para 1	The particle density between 5e-8 and 4e-6 particles per meters cubed is assumed in this report. However, in Sula's, "Radiological Survey of Exposed Shorelines and Islands of the Columbia River Between Vernita and the Snake River Confluence" 1980, for D-Island, he gave a density of 5e-3 particles per square foot at 6 inch depth. This converts to approximately 4.2 particles per meters cubed. Secondly, a density of 1.3 particles/100 square meters for D-Island was reported by Washington State Department of Health survey report, "Radiological Survey of 100 D-island," Jaquish 1995. This roughly equates to 0.1 particles per meters cubed. A USRADS survey in April 1992 found 107 discrete radioactive particles in approximately 12.5 acres surveyed. This should roughly equate to 0.17 particles per meter cubed if the 6 inch depth is assumed. Also, since this survey was done on a 10 foot grid pattern and all particles the effective width of the survey instruments was about one foot, it is likely that the majority of the particles within the survey area were not found. It is recommended that D-Island be evaluated separately. and show calculations. Ecology believes that a wider range of densities exists and should be looked at accordingly.
349.	Ecology	4.11, para 2	The specific equations for cobalt-60 particle exposure should be developed more formally mathematically and incorporated into Section 6.0 of the report, along with other equations.
350.	Ecology	4.12, para 2	Clarify what the toxic endpoint is for inhalation exposure. By not including a slope factor in the inhalation equation, I am assuming the endpoint is a noncancer effect (e.g., burn, ulceration). Is this correct?

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351.	Ecology	5.1, para 3	It is not clear from this paragraph and the inclusion of the groundwater pathways in the corresponding Table 5.2 whether the Agricultural Resident Scenario is onsite, offsite or both. How many and which Agricultural Resident Scenarios are to be used?
352.	Ecology	5.2	In some cases, HSRAM specifies different exposure factors for noncarcinogens vs. carcinogens (e.g., in the agricultural scenario, air inhalation is 10 m^3/day for noncarcinogens vs. 20 m^3/day for carcinogens). Values in Table 5.2 appear to be a mix. A rationale should be given.
353.	Ecology	5.3	Same comment as for page 5.2 applies here.
354.	Ecology	5.3	Should "groundwater" be "seep/spring," as in the HSRAM resident scenario in Table 5.1?
355.	Ecology	5.3	HSRAM lists 1 g/day for game ingestion in various scenarios for the same 45 kg deer/family/yr assumed by Paustenbach (1989). So, where does 15 g/day come from?
356.	Ecology	6.1, para 1	Amend first two sentences to explain that the exposure equations included in this section calculate intakes only and that these doses will be combined with cancer slope factors and reference doses to determine cancer risk and hazard quotients, respectively, in a future report.
357.	Ecology	6.2, para 2	Note that for noncarcinogens, ED=AT, so that these terms cancel. For carcinogens, dose is averaged over lifetime (AT=70 yrs), so that ED does not necessarily equal AT. This comment applies to all non-radiological equations (dermal, inhalation, ingestion).
358.	Ecology	6.3, para 2	Because dermally absorbed dose is expressed per day, a weighted average should be calculated for combining results of children and adults. Simple dose summation is incorrect due to the "per day" factor. This comment applies to all non-radiological equations. On the other hand, dose summation is appropriate for combining separate radiological doses expressed in rem (no time factor). Also, further refinement could be achieved for estimating intake by evaluating even more age categories separately (e.g., 6-21 yrs of age).
359.	Ecology	6.5, para 2	Units for contaminant concentration (C) in river water, seep water, and milk should be expressed as mg/L, not mg/kg. Similarly, units for ingestion rate (IR) of river water, spring water, and milk should be expressed as L/day, not kg/day.
360.	Ecology	6.5, para 3	Elaborate on how concentration values would be estimated from "concentration ratios, bioaccumulation factors, or other related techniques."
361.	Ecology	6.6, para 2	Units for contaminant concentration (C) in river water, seep water, and milk should be expressed as pCi/L, not pCi/g. Similarly, units for ingestion rate (IR) of river water, spring water, and milk should be expressed as L/day, not kg/day.
362.	Ecology	6.6, para 3	Same comment as page 6.5, para 3.
363.	GSSC	General	HSRAM includes very conservative assumptions which have been agreed upon by the Tri-Parties. In many cases, this report applies even more conservative assumptions than HSRAM. This will possibly produce results with limited utility since they are predicated on extraordinary assumptions. Such conservative assumptions should be more thoroughly documented.

No.	Reviewer	Location	COMMENTS
364.	GSSC	General	The introductory information states that the scenarios reflect possible uses of the Hanford Site in the near future. Until substantial cleanup activities have occurred, all of these scenarios except industrial worker, fish hatchery worker, and recreational visitor appear to be unrealistic. Consequently, it appears as if current conditions (contaminant concentrations) will be used to evaluate scenarios which are not currently feasible. A more thorough explanation for this apparent disconnect would be helpful in the final document.
365.	GSSC	Section 3 (general)	The scenarios report does not specify how different weights for children and adults are handled (i.e., HSRAM specifies body weights as 16 kg for children and 70 kg for adults, and this information has not been provided in this report). Please clarify.
366.	GSSC	General	The report must clearly define the study area for the CRCIA--both in the long term and short term. The report should then use the "study area" instead of "Hanford Reach." Rational: The report is unclear in the description of the study area. On page v of the Preface, the area of the "Hanford Reach to the Pacific Ocean" is introduced. Later on page v, under Background, a description for the Hanford Reach is given. (Note that the McNary Pool boundaries are not established in any of the figures). Later on page vii, "the segment of the Columbia River from Priest Rapid Dam... to McNary Dam... is defined as the study area. Generally the report foci are on the Hanford Reach, as well as a biased view on the need to preserve it, rather than a presentation of the current conditions, and makes NO mention of the study area above the Vernita Bridge nor below the head of the McNary Pool.
367.	GSSC	General	The scenarios should be more consistent in the evaluation of individuals. For example, in the Agricultural Resident Scenario a person ingests 566 g of food while in the Native American Subsistence Resident Scenario a person ingests 1394 g of food. This means that the person being evaluated in one scenario would be half the size of the person in the other scenario, since both scenarios are for active lifestyles. Please address this inconsistency.
368.	GSSC	General	Comprehension of all the scenarios is difficult, and the purpose for preparing all these scenarios is lost since there is connection between them. Similar exposures should be emphasized in order to show the relationship between these scenarios.
369.	GSSC	General	There is substantial use of "professional judgement" without explanation and justification. Thus selection of many of the parameters appears not always rational or scientific, and introduces biases.
370.	GSSC	General	The process for developing these scenarios is not clear in Section 1.
371.	GSSC	General	Many of the scenarios fall into the trap of worst-worst-worst case scenario. Suggest trying to accurately estimate range of parameters within a scenario, and then agree upon safety factors for conservatism.
372.	GSSC	General	Scenarios which are not directly related to activities associated with the river tend to detract from the purpose and impact of the CRCIA. Suggest reducing the number of scenarios considered.
373.	GSSC	Page 2.1, Section 2.2	It is unclear why the corporate affiliation of Scientific Ecology Group is pertinent to the presentation.
374.	GSSC	Page 2.3, Table 2.2	The contact rates for soil (external) and surface water (external) are listed as 8 hr/day. The previous page states that hatchery workers are outside 50-60% of the time. While inside the workers should be shielded from external exposure. It is unclear if the 50-60% should be factored into the contact rate, or if that is handled elsewhere in the model. Please clarify.

No.	Reviewer	Location	COMMENTS
375.	GSSC	Page 3.3, Section 3.1, bullet 5	It is unclear why the ranger (10 m3/day) is only inhaling half as much air per day as the fish hatchery worker (20 m3/day). The fish hatchery worker is based on the HSRAM industrial scenario, which specifies 20 m3/day, based on MTCA. The difference could be due to the reduced amount of time the ranger spends on land (3 hours in upland and 3 hours in shoreline area), but the justification for 10 m3/day needs to be included in the text (note that comment also applies to soil inhalation pathway.
376.	GSSC	Page 3.4, Table 3.1	According to this table, the ranger will ingest 100 mg of soil and 100 mg of sediment. The soil ingestion rate is comparable to the hatchery worker scenario, which may be unwarranted considering the fraction of time the ranger spends on land, especially considering the additional sediment ingestion pathway. Please consider reducing these ingestion parameters (down to 50 mg, the HSRAM specification).
377.	GSSC	Page 3.7, Section 3.2, bullet 7	Please add a reference for the average pheasant mass and percentage of edible mass.
378.	GSSC	Page 3.7, Section 3.2, bullet 8	Please add a reference for the average duck mass and percentage of edible mass.
379.	GSSC	Page 3.9, Table 3.3	There are a few discrepancies between the CRCIA recreational visitor scenario and the HSRAM recreational scenario. These discrepancies include: for soil and sediment dermal exposure, HSRAM has 6 year exposure duration for children and 24 year exposure duration for adults; and for game ingestion, HSRAM lists 1 g/day as the intake rate.
380.	GSSC	Page 4.1, Section 4.0, paragraph 3	"Seep/spring water could be used for ingestion and biotic uptake directly from in situ groundwater, but it is assumed that irrigation would not occur (an unresolved issue.)" It is unclear if this sentence is referring to irrigation using seep/spring water or irrigation in general (using surface water.) In addition, the statement "...it is assumed that irrigation would not occur (an unresolved issue)" implies that certain other scenarios in the report represent actual future land uses that DOE has agreed to. Land use has not been determined, and consequently the future of irrigation is no less certain than the future of fish hatcheries or recreation areas. Please clarify.
381.	GSSC	Page 4.2, Section 4.1, paragraph 1	What is meant by the statement that "...the horse is the ultimate receptor?"
382.	GSSC	Page 4.2, Section 4.1, paragraph 1	"Access to seep/spring water for all uses except irrigation and surface water are assumed, as is access to the shoreline." The word order of this sentence allows for multiple interpretations. Please rephrase: "Access to surface water and seep/spring water for all uses except irrigation is assumed, as is access to the shoreline."
383.	GSSC	Page 4.3, Section 4.1, bullet 4	It is unclear why the ambient air mass loading value has been doubled from that used in the other scenarios. This should be scenario-independent. Please justify or use the default value.
384.	GSSC	Page 4.3, Section 4.1, bullet 6	It is unrealistic to assume 2L of seep/spring water ingestion 365 days/yr. The seeps are not accessible for several months of the year due to the river water level, and consequently other water sources would have to be used during those times. Please reconsider.

ATTACHMENT A

Scenario	Activities	Days of Exposure/ Years	Hours Per Day	Where Exposure Occurs	Plants or Animals Ingested	Water Ingested
Industrial Worker						
Fish Hatchery Worker						
Ranger						
Hunter/ Fisher						
Recreational Visitor						
Subsistence Resident						
Hunter/ Gatherer						
Cultural Activities Visitor						
Columbia River Island User						
Resident						
Agricultural Resident						