Meeting Minutes
Columbia River Comprehensive Impact Assessment
Weekly Management Meeting
December 5, 1995 - ETB Building, Columbia River Room, 1:00 - 4:00

Attendees(*)/Distribution(#):

Dick Biggerstaff, BHI*#
Michael Blanton, PNNL*#
Bob Bryce, PNNL*#
Amoret Bunn, Dames & Moore*#
Paul Danielson, NPT*#
Greg deBruler, HAB*#
Kevin Clarke, RL#
Roger Dirkes, PNNL*#
Sue Finch, PNNL*#
Larry Gadbois, EPA*#
Stuart Harris, CTUIR*#
Doug Hildebrand, RL*#
Dave Holland, Ecology*#
Tony Knepp, BHI*#
Jay McConnaughey, WDFW*#
Dick Moos, BHI#
Nancy Myers, BHI*#
Lino G. Nicolli, YIN*#
Roger Ovink, BHI#
Doug Palenshus, Ecology*#
Ralph Patt, Oregon*#
Kay Saldi, AScI Corporation
Stan Sobczyk, NPT#
Bob Stewart, RL*#
Dan Tano, RL*#
Mike Thompson, RL*#
Arlene Tortoso, RL*#
Donna Wanek, RL*#
JR Wilkinson, CTUIR#
Thomas W. Woods, YIN*#
Jerry Yokel, Ecology*#
Admin Records-CRCIA#

Summary of Discussions:

Hanford Groundwater Remediation Strategy - Doug Hildebrand

Doug Hildebrand gave a presentation on the Hanford Groundwater Remediation Strategy with the attached viewgraphs. The following is a summary of discussions and questions from the presentation.

- The present document has been out for comment and is being refined to provide a technical basis and a decision process for determining remedial actions at specific plumes if appropriate.
- Any currently unpublished Hanford information used in the report will be made publicly available.
- This effort is focusing the modeling of plume predictions on the limited number of major contaminants listed on the "Modeling Methods" viewgraph.
- Remediation is taking place primarily in the groundwater as of now. Present modeling does not cover the vadose zone. The groundwater transport model is used to determine how fast the plume is moving. There is some vadose component on interaction with the soil and how fast things move. The groundwater transport model is oriented towards the existing eleven major plumes on the Hanford reservation. Currently, we are working on obtaining an idea of the magnitude of the problem on known groundwater plumes. Predicting future vadose plumes is a whole different scope of work.
- A suggestion was made that the groundwater study needs a "parking lot" similar to the CRCIA study to capture future work that is needed.
- The specific plumes tat will be addressed in this modeling activity are emulating the 200 Area plateau. We have the most information on the flow system and least information on the chemistry.
- A question was raised about the HR-3 chromium issue. Does this information tell you where

to put wells? It indicates where the contact area is and where it is important to intercept and treat. To determine pump and treat areas and proceed with effective remediation, you need to understand the conceptual model, understand the groundwater, determine what is a safe level, and look at all of the data. The chromium data from D area could influence pump and treat in that area; however, can't predict outcome.

- The baseline for nitrates indicates dissipation through natural attenuation. We will model nitrates to answer the question of whether other nitrate plumes will dissipate through natural attenuation.

- A question was asked about the latest data for uranium in the 300 area. It has leveled off; initially from 300 area process trench area. Currently no water is going into trench. It was noted that it would be wise to address this in the study to make it complete. The 300 area was not included because it was previously studied.

- A question was raised about bank storage effects. There are seasonal and daily effects from the change in the river level. The river levels are the lowest in the fall and would anticipate finding highest concentration. In the March to July time frame, we expect to see dilution; however, depending upon the time of day for sampling, may see back and forth.

- Once the key plumes are addressed, what are the thoughts about future additional work that needs to be done? Is there a plan to evaluate where to go next for areas not currently addressed as they are not critical now, or beyond 200 years? Assuming there are future tasks, when and where will they be addressed? The strategy is updated yearly or a minimum of every three years.

- There was discussion about a future vitrification plan. Information will be used. Will perform cost benefit analysis. If decisions with tanks, HWVP, etc. look like major changes, we will go back and revise the strategy.

- Group is currently working towards standardizing models (TPA, EIS). There are actions within our organize to have standard models for predictions. Models will be open for public discussion.

- The study needs to identify the time plains where peak concentrations will be observed. If the sources are eliminated, then you don't need to identify the peak concentrations. Make an estimate of what the loads are, look at the sources, speculate on inventory, then decide if there is a peak. Some of this work is partially done but may not be in the public arena. It was restated that we need to account for the inventory; can't talk about a fraction of the inventory. Agreed, inventory as known. Need to clearly state assumptions.

- Many comments brought up today tie into the last slide on the decision process. Part of the decision process is to evaluate the model and to take modeling results into consideration for remediation study. The decision process would identify if you don't have inventories available.

- The CRCIA management team can work on the parking lot task to identify future work for groundwater remediation strategy. This would provide an opportunity for stakeholders to look at what we are doing. Dave Holland, Ralph Patt, Greg deBruler, Paul Danielson, and Stuart Harris agreed to take action to outlined parking lot items pertaining to the groundwater remediation strategy by the end of January.

- Amoret Bunn took the action to get names of team members to Doug Hildebrand to obtain copies of the remediation strategy.

Nonradiological Chemical Pathway Analysis and Identification of Chemicals of Concern for Environmental Monitoring at the Hanford Site - Michael Blanton

This report will be sent out to the distribution list this week. A limited number of copies are at today's meeting. If your name is on the distribution list, please wait for your copy. Copies of the viewgraphs were not handed out at the meeting but are attached to these meeting minutes. A summary of the presentation and discussion is provided below.

- To meet the goals and objectives of the SESP, this study was undertaken. It began in late 1993. Information was provided to Bruce Napier for use in the CRCIA Contaminants of Concern report. There is a long laundry list of non-rad pollutants that could be monitored for. The project is currently working with limited resources. This report determines the non-rad contaminants of concern, sensitive media, and chemicals affecting offsite human health. It is also an aid for SESP in choosing media sampling locations.

- The study approach was three phased as identified in the viewgraphs.

- Discussed figure 3.1, Conceptual Design of Chemical Pathway Analysis. The MEPAS code/model was used for fate transport modeling. The modular risk assessment (MRA) approach was used. MRA assumes linearity, i.e., when input is double, the output will also double. This is not a random assumption; used the MEPAS code, sensitivity/uncertainty to demonstrate that if you double the source term, the risk does double. Determine a suite of chemicals of concern, use the maximum concentration, and run through the model. Output includes offsite risks, sensitive pathways, and what chemicals drove the risk. To bound the chemical pathway analysis, the information was run back through the model. The transfer factors/pathways included in the model are surface water, atmospheric, and groundwater. The model assumed no offsite human exposure via Hanford derived groundwater as this groundwater does not reach offsite wells. The model was ran to determine the risk of drinking water from a well offsite, but those results were not included in the report.

- What were the dimensions of the waste site? With the MEPAS code, the further away your end point is, the more the contamination site looks like a point source. The sensitivity analysis conducted by the MEPAS developers show that as the size of the concentration area is varied, it does not impact offsite risk. The support for this information is contained in a reference in the document.

- The model can achieve all exposure pathways in Figure 2.2 over a period of 70 years and is strictly for human health. This study did not consider ecological impacts.

- The source for onsite residential exposure scenario came from previous Hanford site studies.

- The approach used in this study met our objectives of using results to help guide future monitoring. We did not do sensitivity or uncertainty analysis.

- After completing the exercise, Table 1, Chemicals of Concern and Maximum Onsite Concentrations, was developed. The report breaks down the data by specific area. All data is in the appendix. Our study did not find suitable data for 200 areas. We used what source term data was available and scientific judgement as to whether to include. Maximum concentrations were used.

- Table 2, Retrospective Pathway Analysis Chemical List, was used to help bound in the retrospective analysis, e.g. when the model was run in reverse. Following the modeling exercise, results indicated that three chemicals made up over 99% of the cancer risk to the maximally exposed individual: arsenic (84%), carbon Tetrachloride (10%) and bis(2-ethylhexyl)phthalate (6%). The last chemical is a plasticizer that is used in sample tubing and bottles. The surface water-exposure pathway was found to be the most sensitive pathway for cancer incidence and contributed over 53% of the calculated risk. In addition the aquatic food consumption pathway contributed approximately 34%. Together, they account for over 80% of the risk.

- Section 2 of the report talks about where chemicals were used during production at Hanford and how disposed of. Table 4.3 gives the MEPAS model results.

- Input from team members is always welcome. The report may not be republished, however, the information is to be used to guide future sampling.

- Results from this report confirmed that SESP was on the right track for chemical sampling.

- For non-carcinogenic effects, chromium was the largest contributor to the hazard index (assumed to be chromium [IV], 62%, following by nitrates, 38). The most sensitive pathway for noncarcinogenic chemicals was aquatic food consumption (62%) followed by surface water (33%). Together, they account for 90% of the risk.

- Retrospective modeling results showed only three of the identified COCs could occur in soil concentrations high enough on site to cause an offsite health risk of 1.0E-06 cancer incidence or a 1.0 hazard index for a given receptor/exposure pathway. Of the "other chemicals" used in the retrospective analysis only vinyl chloride and thallium could realistically occur in soil concentration sufficient to reach the targeted health-risk criterion (in addition to the chemicals of concern previously identified).

- The conclusions included in the handout were reviewed. It was noted that arsenic was not used in the production process; concentrations may be attributable to coal fire generators. Table 5.1 identifies chemicals of concern in this report compared to those in Bruce Napier's report. The chemicals that are bolded are SESP chemicals of concern; those with the ^ after them are a CRCIA chemical of concern. The primary differences occur because this study only focused on human health and did not look at ecological impacts.

- Standard EPA superfund site human health parameters were used.

- For further information, see report number PNL-10714, Blanton et.al, 1995.

Update on River Substrate Investigation - Arlene Tortoso, Dick Biggerstaff

- At the time of my last update, we had sampled up to transect 45. We have now sampled up through transect 51. We started in the K-reactor area. Due to additional flow of the river and mild and wet weather conditions of late, pore water sampling has been suspended for next couple of weeks. We have now completed the D reactor area. The handout presents results to date. The circles indicate 5 foot "a" depths and the squares indicate 10 foot "b" depths. Where areas were not sampled, it was due to boulders and deep water around the pump station, or lack of adequate depth in other areas.

- The viewgraph displaying preliminary pore water sampling results was presented. For the most part, deep water sampling had much lower levels of concentration or non-detects; however, transect 16 deeper water sample was higher than the lower level sample.

- A color viewgraph, Chromium Concentrations in Riverbed Sediments, was presented and discussed. Along the green band, the inner edge represents the "a" sample locations and the outer edge represents the "b" sample locations. The green zone is below the ambient water quality criteria of 11 PPB, the yellow is within EPA drinking water standards, < 100 PPB, and the red exceeded standards, > 100 PPB. In the red area, there is a potential groundwater source in addition to the process sewer as it was traced up river. There is one high reading by the solid waste burial ground. It is possible that the higher concentrations could be coming from the solid waste burial ground or possibly N-reactor area. The red areas adjacent to the retention basins are driving the IRM process. High values were found in the area planned for the 100-D area pump and treat location.

- The habitat suitable for salmon spawning is shown on the viewgraph as a grey crosshatch. The divers determined this from suitable size gravel, imbeddedness, and depth. Careful notes were taken of the type of substrate they were dealing with. The highest chromium concentration is in a boulder field (process sewer area). The other end is clay base and very shallow with only 3-6 inches of gravel on top of the clay. The blue circles represent the salmon redds (spawning areas) determined from a 1991 aerial survey by PNNL. The blue pattern essentially overlies the crosshatched area that is historically used for salmon spawning. Another part of the program is the discharge monitoring network which uses drive points on shore. The drive points are driven in those areas where the river pore water samples show chromium higher than 11 ppb. These drive points go down anywhere from the river substrate sampling depth of 18 inches to 5 feet below this point to 5 feet below that (or ten feet). This sampling at the three depths occurs along the shoreline indicated on the map by the dashed/circled line.

- The test wells are in the D reactor area. There is about ½ mile of upriver pore water sampling with no associated monitoring wells.

- Roger Dirkes was asked if the SESP does any seep sampling. The SESP currently samples seeps between 17 and 15, closer to 15. It has been a long time since SESP staff have walked the shoreline. WHC walks 100N to 100D. Dick noted that more seeps are seen here than what has been seen in prior reports as crews are out every day working very hard to locate all of the seeps. A seep is 90+% related to bank recharge whereas a spring has a continuous source of discharge independent of river level changes. Everything shown on the viewgraph is a seep.

- We have looked at seep sample concentrations as a result of river fluctuations by sampling at various times through the day; we saw the same relative discharge concentrations. It's important to know what you're dealing with, i.e. if deep enough to see groundwater or in the mixing zone.

- This scope of work is anticipated to be completed in February. Good progress has been made. Because of river conditions, work won't resume on the river until late December. K and H areas are still left to complete. K area has many boulder fields. It was noted that it appears that the study should go further up river. However, the plan was to go to transect 45 and we have already gone to transect 51. Current program objectives have been met however, that does not preclude going back in the future.

- Department of Ecology representative asked if an objective of the study was to collect eggs. This was discussed early on in the program but is not planned for this year. Ecology requested that eggs be collect and Ecology would send them off to the lab for sample analysis. This raised the issue of whether or not a permit was in place to collect salmon eggs. It was then noted that the K and H areas do not historically have any salmon redds. It was also noted that redds are only visible for a few weeks, maybe a month, in the November time frame.

TPA Change Request

Bob Stewart handed out a copy of the attached draft TPA milestone change request for team review. Much discussion on items M-15-80A and M-15-80B resulting from varying interpretations. Initial interpretation that M-15-80A is the comprehensive section and is not part of M-15-80 which is the draft report due 7/31/96. It was clarified that M-15-80 does include the comprehensive list/section. Milestones M-15-80A and B were added to provide a driver to complete the remaining work identified in the comprehensive section of M-15-80. Specific wording changes were recommended. Bob Stewart took the action to revise the milestone and fax out to all team members by the end of the week.

Comprehensive Chapter:

- Vadose zone.
- Travel time from tanks to river.

Agreements:

- None reached at this meeting.

Action Items:

Action Description	Assigned To	Due Date
Outline parking lot items pertaining to the groundwater remediation strategy.	Dave Holland, Ralph Patt, Greg deBruler, Paul Danielson, and Stuart Harris	End of January
Get names of team members to Doug Hildebrand to obtain copies of the remediation strategy.	Amoret Bunn	ASAP
Revise TPA milestone per team suggestions and fax to team members for review	Bob Stewart	12/7/95

Date/Location of Next 2 Scheduled Meetings:

- Tuesday, December 12, 1:00 - 4:00, EESB Snoqualmie Room
- Tuesday, December 19, 1:00 - 4:00, ETB Building, Columbia River Room

Attachments:

- 12/5/96 meeting agenda (original)
- 12/5/96 revised meeting agenda
- Presentation viewgraphs by Doug Hildebrand, "Hanford Groundwater Remediation Strategy"
- Presentation viewgraphs by Michael Blanton, "Nonradiological Chemical Pathway Analysis and Identification of Chemicals of Concern for Environmental Monitoring at the Hanford Site"
- Viewgraph, "Preliminary Pore Water Sampling Results" presented by Dick Biggerstaff
- Viewgraph, "Chromium Concentrations in Riverbed Sediments" presented by Dick Biggerstaff
- Draft TPA milestone change request number M-15-95-09 dated 12-5-95

Prepared by SM Finch on 1/29/96

AGENDA
Columbia River Comprehensive Impact Assessment
Weekly Project Management Team

Scheduled from 1:00 - 4:00 p.m., December 5, 1995
Battelle's ETB Building, Columbia River Room

1. Site-wide Groundwater Remediation Strategy - Tony Knepp/Jerry Chiaramonte, BHI
2. Chemical Pathway Analysis - Mike Blanton, PNL
3. Update on River Substrate Investigation - Dick Biggerstaff, BHI
4. Review/Update TPA Milestone Change Package/Transmittal Letter - Project Team
5. Data Management Team Update - Bob Stewart, RL

Please note:

1) The meeting room has been changed from EESB Stampede to ETB Columbia River Room.

2) Additional staff from BHI/PNL/DOE will be in attendance to hear the Site-wide Groundwater Remediation Strategy and the Chemical Pathway Analysis presentations.

REVISED AGENDA
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Weekly Project Management Team

Scheduled from 1:00 - 4:00 p.m., December 5, 1995
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2. Chemical Pathway Analysis - Mike Blanton, PNL
3. Update on River Substrate Investigation - Arlene Tortoso, RL and Dick Biggerstaff, BHI
4. Review/Update TPA Milestone Change Package/Transmittal Letter - Project Team
5. Data Management Team Update - Bob Stewart, RL

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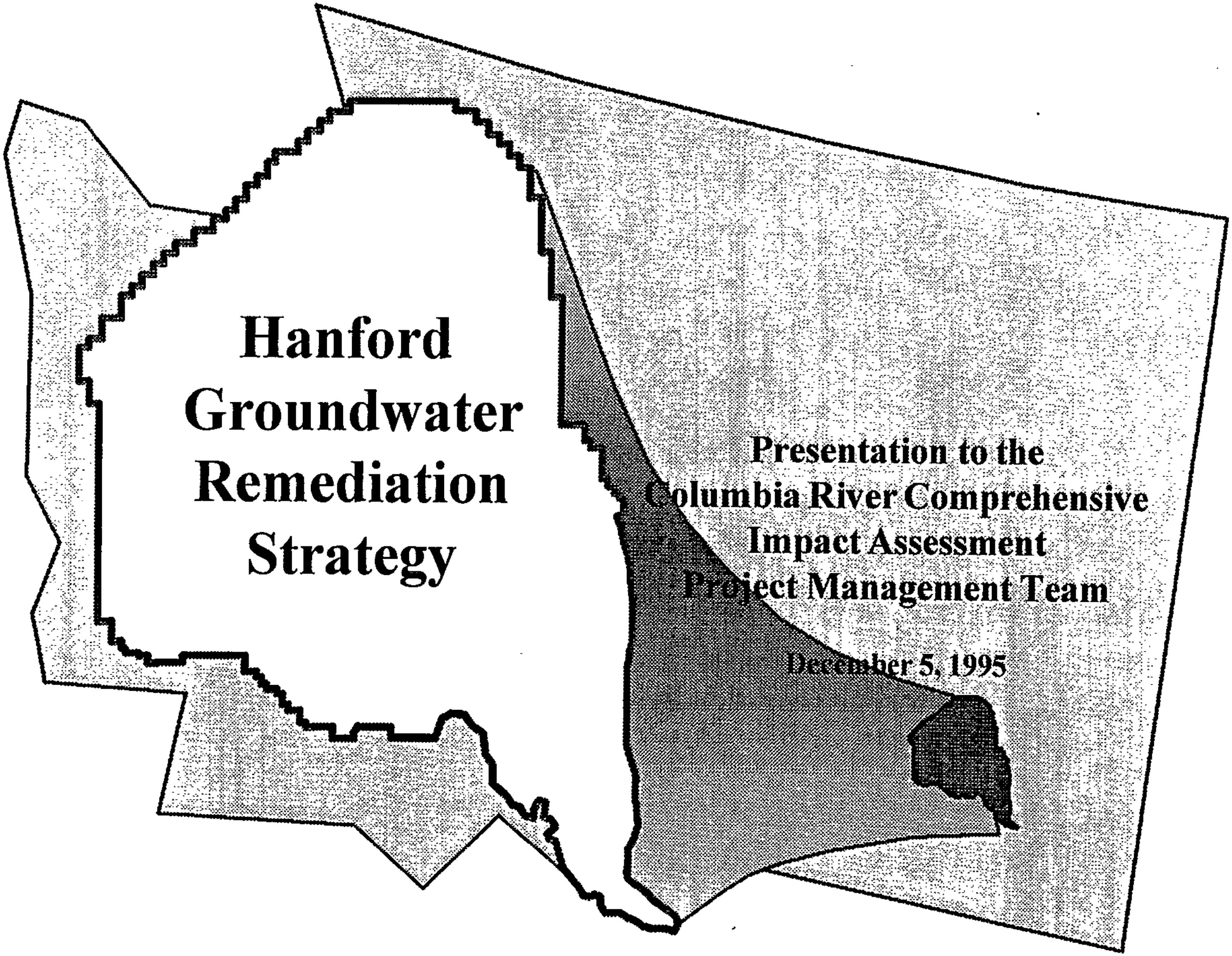

Hanford Groundwater Remediation Strategy
Presentation to the Columbia River Comprehensive Impact Assessment Project Management Team
December 5, 1995

PURPOSE

- THE GROUNDWATER REMEDIATION STRATEGY IS BEING REFINED TO PROVIDE A TECHNICAL BASIS AND A DECISION PROCESS FOR CONDUCTING REMEDIAL ACTIONS AT SPECIFIC PLUMES.

SCOPE

FIVE TASKS ARE INCLUDED IN THE STRATEGY REFINEMENT SCOPE

1. DOCUMENT TECHNICAL SUPPORTING INFORMATION	MARCH 1996
2. PERFORM MODELING FOR PLUME PREDICTIONS	APRIL 1996
3. DEVELOP A REMEDIATION DECISION PROCESS	JANUARY 1996
4. INTEGRATE MONITORING FOR STRATEGY IMPLEMENTATION	MARCH 1996
5. REVISE THE STRATEGY DOCUMENT	JUNE 1996

SCOPE OF SUPPORTING TECHNICAL INFORMATION

ASSEMBLE PERTINENT TECHNICAL INFORMATION FROM PREVIOUSLY PUBLISHED AND UNPUBLISHED HANFORD INFORMATION SOURCES

Summarize for each major plume:

- Operating history
- Historical geosciences information
- Conceptual site model
- Risk analysis
- Treatability studies
- Conceptual interim remediation plans
- Future data needs

SCOPE OF PLUME PREDICTIONS TASK

EVALUATE AND COMPARE THE LONG-TERM EFFECTS AND COSTS OF BOTH "NO ACTION" AND ACTIVE REMEDIATION EFFORTS

- For each major plume, evaluate the groundwater conditions from current through 200 years from now:
  1. Assuming no active remediation
  2. Assuming pump and treat/hydraulic containment and above ground treatment are actively pursued.
- Make estimates of future risk and compliance with groundwater standards (ARARs)

MODELING METHODS

		METHOD		
		ERC Sitewide Model	Local Model	Engineering Calculations
N-Springs	^{90}Sr			X
HR-3	Chromium		X	
KR-4	Chromium		X	
200 Area				
Widespread	^{129}I	X		
Widespread	Nitrate	X		
Widespread	Tritium	X		
ZP-1	Carbon tetrachloride	X		
UP-1	Uranium and Technetium	X		

DECISION PROCESS TASK

DEVELOP A CONSISTENT AND THROUGH PROCESS FOR REACHING DECISIONS ON GROUNDWATER REMEDIATION FROM PROBLEM DEFINITION THROUGH REMEDY

Develop a decision tree and decision criteria for required activities:

- Initial site investigations and plume screening
- Treatability studies
- Interim actions
- Final remedy selection and implementation

Nonradiological Chemical Pathway Analysis and Identification of Chemicals of Concern for Environmental Monitoring at the Hanford Site

by
M. L. Blanton
A. T. Cooper
K. J. Castleton

Surface Environmental Surveillance Project

- Goals
  - Ensure Compliance With Environmental Regulations
  - Confirm Adherence to DOE Env. Protection Policies
  - Support Environmental Restoration and Waste Management Decision Making
  - Provide Public Assurance

Surface Environmental Surveillance Project

- Objectives
  - Monitor Radionuclides and Chemical Contaminants in the Environment Attributable to Operations at Hanford.
  - Assess the Integrated Effects of These Contaminants on the Environment and to the Public.

Chemical Pathway Analysis

- Goals and Objectives
  - Selection of Environmental Surveillance Parameters
    - media
    - sampling location
    - chemicals of concern

Study Approach

Three Phased Approach:

1. Identification of Chemicals of Concern
2. Model Offsite Fate, Transport, Exposure and Relative Human-Health Risk
3. Ranking and Prioritizing Chemicals of Concern and Exposure Media.

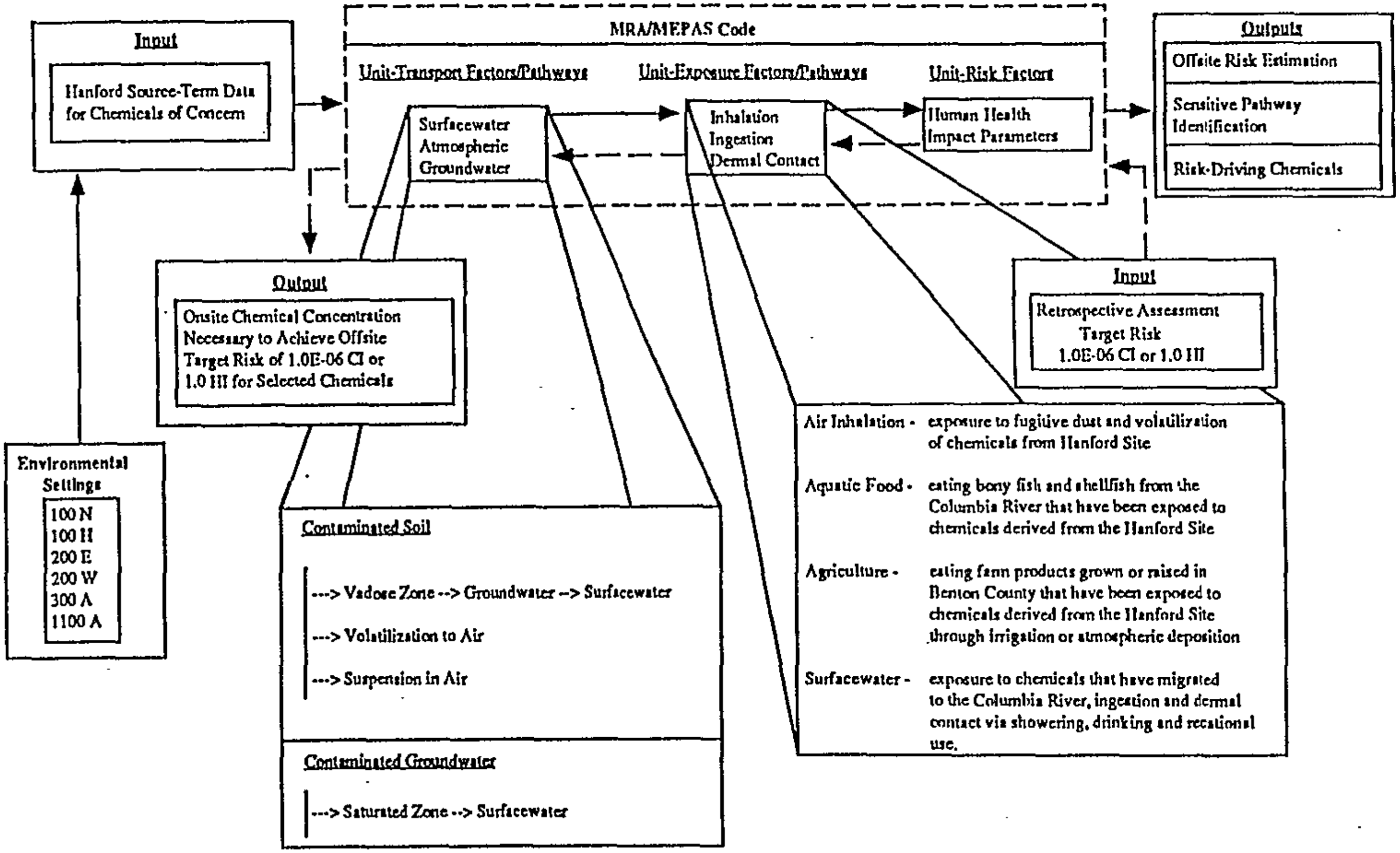


Figure 3.1. Conceptual Design of Chemical Pathway Analysis

Source Term/Identification of Chemicals of Concern

- Analyties were screened and COC were chosen based upon the following assumption:
  - a chemical detected onsite and not posing a significant health risk from a residential-use onsite-exposure scenario would not pose a significant human-health risk to offsite receptors because concentrations of the chemical would be reduced during transport offsite.

Direct Chemical Pathway Analysis Results: Carcinogenic Effects

- Three chemicals made up over 99% of the cancer risk to the maximally exposed individual, arsenic (84%), carbon tetrachloride (10%) and bis(2-ethylhexyl)phthalate (6%).
- The surfacewater-exposure pathway was found to be the most sensitive pathway for cancer incidence and contributed over 53% of the calculated risk. In addition the aquatic food consumption pathway, contributed approximately 34%.

Direct Chemical Pathway Analysis Results: Non-Carcinogenic Effects

- Chromium was the largest contributor to the hazard index (assumed to be chromium[VI]), 62% followed by nitrates (38%).
- The most sensitive pathway for noncarcinogenic chemicals was aquatic food consumption 62% followed by surface-water 33%.

Retrospective Chemical Pathway Analysis Results

- Retrospective modeling results showed only three of the identified COC (arsenic, bis[2-ethylhexyl]phthalate, and chloroform) could occur in soil concentrations high enough on the site to cause an offsite health risk of 1.0E-06 cancer incidence or a 1.0 hazard index for a given receptor/exposure pathway.

Retrospective Chemical Pathway Analysis Results (continued)

Of the "Other Chemicals" used in the Retrospective Analysis only vinyl chloride and thallium could realistically occur in soil concentration sufficient to reach the targeted health-risk criterion (in addition to the chemicals of concern previously identified)

CONCLUSIONS

- Two primary exposure pathways for offsite human-health risk are surfacewater and aquatic food consumption.
- Arsenic was identified as the primary risk driver for carcinogenic effects and chromium (VI) (for ingestion routes) was identified as the primary risk driver for noncarcinogenic effects.

CONCLUSIONS (continued)

- A comparison of monitoring data with the pathway and retrospective analysis results indicate that nonradiological chemical contamination occurring onsite does not currently pose a significant human-health risk.
- However, the investigation of nonradiological chemical contamination impacts to the ecosystem, either onsite or offsite, was not part of this chemical pathway analysis. Therefore, no inference can be made on the nonradiological effects to the ecosystem (i.e., flora and/or fauna).

Table 1. Chemicals of Concern and Maximum Onsite Concentrations

	Maximum Concentration in Soil (mg/kg)	Maximum Concentration in Groundwater (mg/L)
Ammonia	(a)	0.75
Arsenic	47	0.01
Benzo(a)pyrene	27	(a)
Beryllium	4.7	(a)
Bis(2-ethylhexyl)phthalate	25,046	0.011
Carbon tetrachloride	52	7
Chloroform	(a)	1
Chromium	960	2.09
Chrysene	43	(a)
Fluoride	(a)	1.3
Manganese	(a)	0.18
Nitrate	1136	450
Nitric acid	129	(a)
PCBs	65.29	(a)
Sodium	1420	(a)
Trichloroethylene	0.39	0.019
(1,1,1,2)Tetrachloroethane	1.1	(a)

(a) Not detected or below risk-screening level.

Table 2. Retrospective Pathway Analysis Chemical list.

Antimony
Aroclor 1248 (a PCB mixture)
Arsenic
Asbestos
Barium
Benzo(a)pyrene
Beryllium
Bis(2-ethylhexyl)phthalate
Cadmium
Carbon tetrachloride
Chlordane
Chloroform
Chromium
Chrysene
Copper
Cyanide
Fluoride
Lead
Manganese
Mercury
Methylene chloride
Nickel
Nitrate
Pentachlorophenol
Selenium
Silver
Sulfate
(1,1,1,2)Tetrachloroethane
Thallium
Toluene
Tributyl phosphate
Trichloroethylene
Vanadium
Vinyl chloride
Xylenes

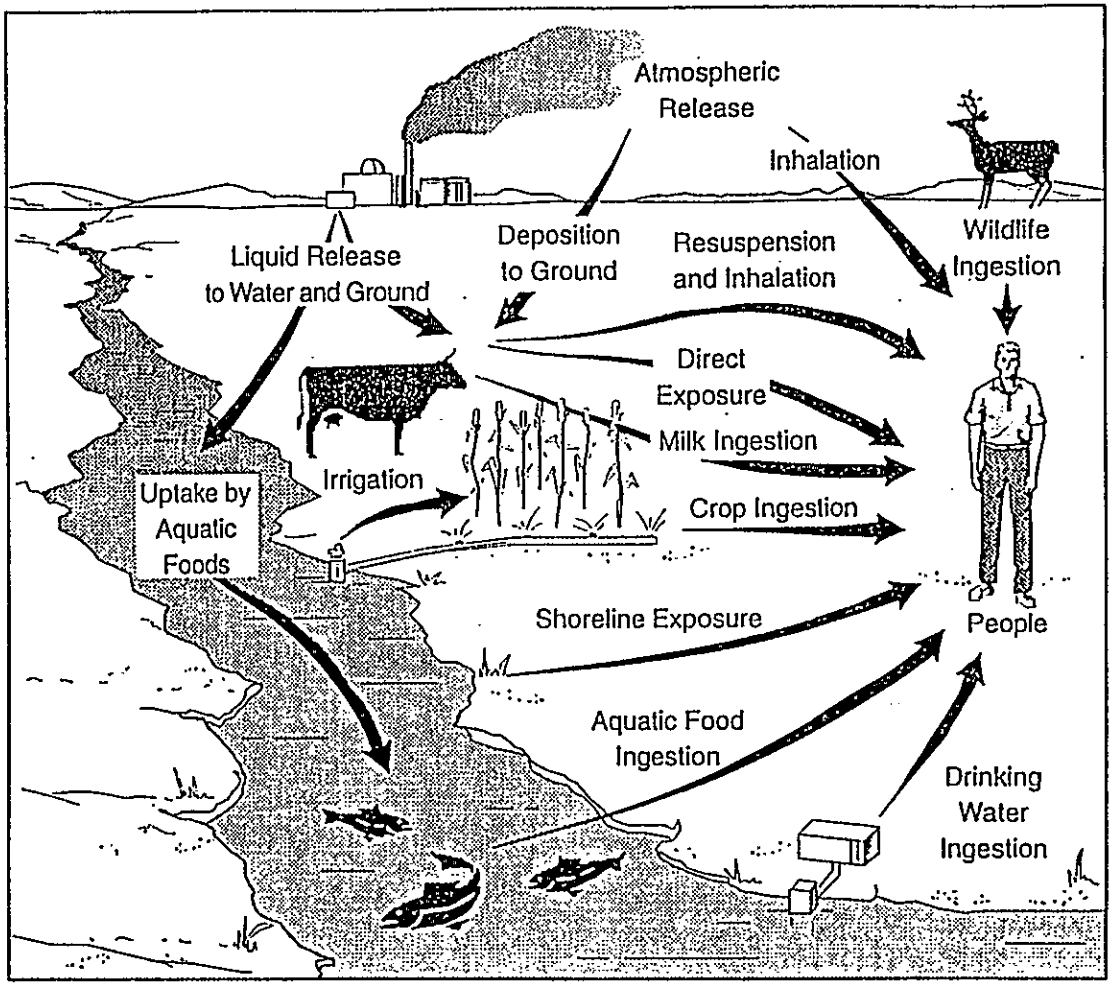


Figure 2.2. Exposure Pathways to Humans

Hanford Site Contaminated Media -->	*Transport Pathway --> -->*	*Receptor Exposure Media*
Contaminated Soil -->	Vadose Zone --> -->	Groundwater Well
Contaminated Soil -->	Vadose Zone --> Groundwater --> -->	Surfacewater
Contaminated Soil --> -->	Volatilization to Air --> -->	Air
Contaminated Soil --> -->	Suspension in Air --> -->	Air
Saturated Zone --> -->	Groundwater Well --> -->	Groundwater Well
Saturated Zone --> -->	Surfacewater --> -->	River

Figure 3.3. Illustrated Contaminant Transport Pathways

Exposure Media -->	*Exposure Routes and Scenarios*
Air/Surface Soil -->	Inhalation and Soil Ingestion
Air/Surface Soil -->	Crops --> Ingestion
Air/Surface Soil -->	Crops --> Animals --> Ingestion
Surfacewater -->	Ingestion
Surfacewater -->	Fish/Shellfish --> Ingestion
Surfacewater -->	Irrigation --> Crops --> Ingestion
Surfacewater -->	Animals --> Ingestion
Surfacewater -->	Bathing --> Ingestion
Surfacewater -->	Recreation --> External Exposure
Surfacewater -->	Recreation --> Ingestion

Figure 3.4. Offsite-Receptor Exposure Pathways and Scenarios (Droppo et al. 1989)

Table 4.3. Offsite Excess Cancer Incidence to Maximally Exposed Individual (expressed by chemical and pathway). The total offsite risk posed from all pathways summed together is also provided for individual chemicals and summation of all chemical inputs contribution.

Chemical	Air Exposure	Aquatic Foods	Agriculture	Surfacewater	Cancer Incidence
Arsenic	3.30E-17	6.04E-11	1.22E-11	1.03E-10	1.76E-10
Benzo(a)pyrene	3.86E-16	0.00E+00	2.30E-17	0.00E+00	4.09E-16
Beryllium	8.66E-18	0.00E+00	8.81E-19	0.00E+00	9.54E-18
Bis(2-ethylhexyl)phthalate	6.93E-16	6.91E-15	1.31E-11	1.24E-14	1.31E-11
Carbon tetrachloride	1.97E-19	1.19E-11	2.19E-13	8.37E-12	2.05E-11
Chloroform	(a)	1.38E-17	3.40E-17	2.31E-16	2.79E-16
Chromium(VI)	3.27E-15	(b)	(b)	(b)	3.27E-15
Chrysene	6.15E-16	0.00E+00	2.62E-17	0.00E+00	6.42E-16
Polychlorinated biphenyl (Aroclor 1260)	1.78E-16	0.00E+00	7.46E-17	0.00E+00	2.53E-16
Trichloroethylene	8.50E-21	4.17E-15	2.43E-15	1.07E-13	1.14E-13
(1,1,1,2)Tetrachloroethane	1.90E-22	(b)	(b)	1.34E-14	1.34E-14
Total Offsite Risk	5.19E-15	7.24E-11	2.55E-11	1.11E-10	**2.09E-10**

(a) The source-term data used for this chemical occurred in the groundwater only; thus, this chemical would not be exposed to the receptor through this pathway.
(b) This chemical is not classified as a carcinogen through this pathway.
Bolded value represents the total offsite cancer incidence risk to the maximally exposed individual from exposure to all viable contaminants of concern.
A hypothetical groundwater pathway was investigated and found to be below the U.S. Environmental Protection Agency action level of 1.0E-06 and is not reported here because it is not a viable pathway. See text for clarification.
Contaminants of concern that are not listed in this table are not considered to be carcinogens; therefore, they appear in Table 4.4.

Table 4.4. Offsite Excess Hazard Index to the Maximally Exposed Individual (expressed by chemical and pathway). The hazard quotient (summed hazard index values) is also provided for individual chemical and pathway and for the total of all pathways combined.

Chemical	Air Exposure	Aquatic Foods	Agriculture	Surfacewater	Hazard Index
Ammonia	(a)	0.00E+00	1.38E-12	2.08E-11	2.22E-11
Chromium(VI)	1.04E-08	5.79E-05	9.58E-06	8.05E-05	1.48E-04
Fluoride	(a)	7.32E-13	6.09E-12	2.27E-11	2.95E-11
Iron	0.00E+00	7.79E-11	2.46E-12	2.41E-12	8.28E-11
Manganese	(a)	2.69E-10	3.35E-11	1.04E-10	4.07E-10
Nitrate	2.29E-18	1.46E-05	1.32E-07	3.72E-09	1.48E-05
Nitric acid	1.19E-17	7.57E-05	6.61E-07	1.87E-08	7.63E-05
(1,1,1,2)Tetrachloroethane	1.06E-13	2.43E-07	1.54E-08	5.08E-07	7.66E-07
Hazard Quotient	1.04E-08	1.48E-04	1.04E-05	8.10E-05	**2.40E-04**

(a) The source-term data used for this chemical occurred in the groundwater only; thus, this chemical would not be exposed to the receptor through this pathway.

Bolded value represents the total offsite hazard index to the maximally exposed individual from exposure to all viable contaminants of concern.

A hypothetical groundwater pathway was investigated and found to be below the U.S. Environmental Protection Agency action level of 1.0E-06 and is not reported here because it is not a viable pathway. See discussion in text for clarification.

Contaminants of concern that are not listed in this table are not considered to be carcinogens; therefore, they appear in Table 4.3.

Table 4.5. Results of Retrospective Chemical Pathway Analysis

	Onsite Soil Concentration Required to Achieve a 1.0E-06 Cancer Incidence		
	Aquatic Foods (mg/kg)	Agricultural (mg/kg)	Surfacewater (mg/kg)
Arsenic	2.18E+02	8.47E+02	1.01E+02
Bis(2-ethylhexyl)phthalate	(a)	8.40E+02	8.87E+05
Chloroform	(a)	(a)	5.18E+05
Vinyl chloride	5.24E+05	(a)	5.76E+04
	Onsite Soil Concentration Required to Achieve a 1.0 Hazard Index		
	Aquatic Foods (mg/kg)	Agricultural (mg/kg)	Surfacewater (mg/kg)
Chromium(VI)	4.68E+04	2.83E+05	3.36E+04
Thallium	1.34E+04	(b)	(b)

(a) Unable to achieve onsite concentration to reach target risk value of 1.0E-06 cancer incidence through this exposure pathway.
(b) Unable to achieve onsite concentration to reach target risk value of 1.0 hazard index through this exposure pathway.

Table 5.1. Identified Chemicals of Concern

	1994 Monitoring	Special Study Monitoring	Retrospective Analysis
Ammonia	*		
Antimony^	*	*	*
Aroclor 1248 (a polychlorinated biphenyl mixture)^		*	*
Arsenic^		*	*
Benzo(a)pyrene		*	*
Beryllium	*	*	*
Bis(2-ethylhexyl)phthalate		*	*
Carbon tetrachloride^	*		*
Chlordane^		*	*
Chloroform^	*	*	*
Chromium^	*	*	*
Chrysene		*	*
Copper^	*	*	*
Cyanide^		*	*
Diesel fuel^			
Fluoride^	*	*	*
Lead^		*	*
Manganese^	*	*	*
Mercury^	*	*	*
Nitrate^	*	*	*
Phosphate^	*	*	
Silver chloride^			
Sodium	*	*	
(1,1,1,2)Tetrachloroethane^	*	*	*
Trichloroethylene^	*	*	*
Zinc^	*	*	

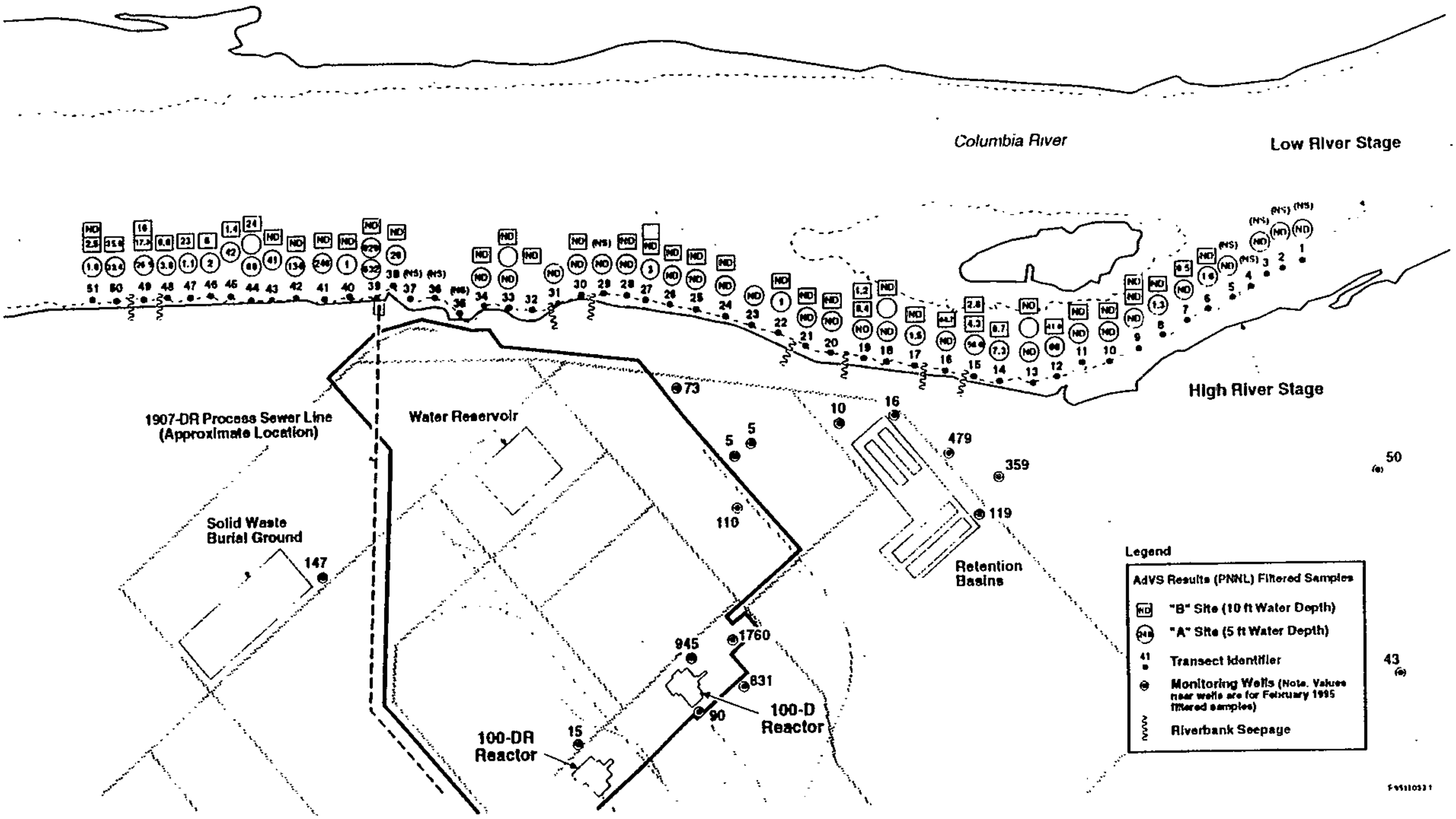
Bolded = SESP chemical of concern.
^ = CRCIA chemical of concern.

Table S.1. Identified Chemicals of Concern

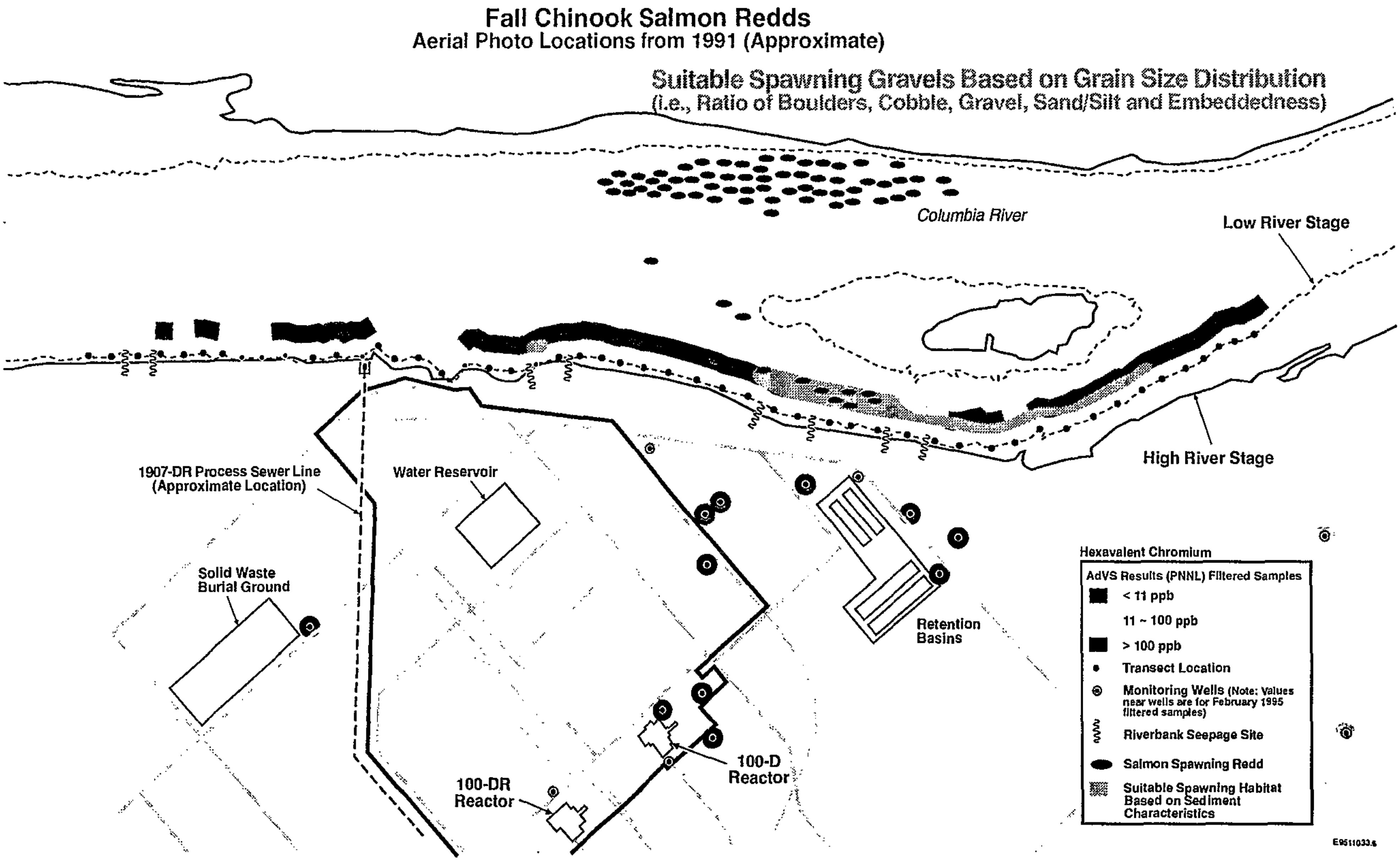
Ammonia	Chrysene
Aroclor 1248 (a polychlorinated biphenyl)	Fluoride
Arsenic	Manganese
Benzo(a)pyrene	Nitrate
Beryllium	Nitric acid
Bis(2-ethylhexyl)phthalate	Sodium
Carbon tetrachloride	(1,1,1,2)Tetrachloroethane
Chloroform	Trichloroethylene
Chromium	

12/5/95

Preliminary Pore Water Sampling Results



Chromium Concentrations in Riverbed Sediments



Change Number M-15-95-09 DRAFT	Federal Facility Agreement and Consent Order Change Control Form	Date 12-5-95

Originators
Bob Stewart - DOE; Larry Gadbois - EPA; Dave Holland - Ecology

Phone

Class of Change
[ ] I - Signatories [X] II - Executive Manager [ ] III - Project Manager

Change Title
Modification to M-15-80 Milestone, the Columbia River Comprehensive Impact Assessment (CRCIA), Scope and Schedule

Description/Justification of Change
Based on consensus of the recently formed CRCIA Management Team (described on page 2):

M-15-80 *Submit the Columbia River Comprehensive Impact Assessment to EPA and Ecology (Human Health and Environmental Risk Assessment) [formerly M-13-80B]*

Submittal date to be determined no later than 12/15/95

is changed to

M-15-80 *Submit a draft interim report for the Ecological Columbia River Comprehensive Impact Assessment (Human Health and ~~Environmental~~ Risk Assessment) that documents completion of the "Agreed-to FY 1996 Work" detailed on page 3 to EPA, Ecology, Technical Peer Reviewers, CRCIA Management Team, and the public for review.*

Due July 31, 1996

M-15-80A *DOE provides a list of* prioritized ~~comprehensive~~ *work scope tasks* which are appropriate under the authority of the TPA, focusing on those which could lead to RCRA/CERCLA clean up actions. This list is to be *developed ~~and prioritized~~ in coordination with CRCIA Management Team (not based on funding).*

Due Sept 30, 1996

M-15-80B *DOE provides a recommendation for follow-on work to M-15-80, based on M-15-80A,* overall Environmental Restoration Project objectives, *and funding ~~considerations~~ (to include scope and schedule).* Results will be consistent with and incorporated into the Environmental Restoration Project Long Range Plan.

Due Dec 31, 1996

M-15-80C-T01 *Submit an interim report for the Columbia River Comprehensive Impact Assessment to EPA and Ecology that incorporates* resolved *EPA, Ecology, Technical Peer Review, CRCIA Management Team, and public comments.*

Target date Oct 31, 1996

Impact of Change No impact to FY 1996 planned work or budget. There are budget impacts in FY 1997 or future years because development of M-15-80B recommendations and execution of follow-on work are not in the current budget plan. Carry-over of FY96 funds into October 1996 (FY97) would be required to complete final editorial and publication costs for the M-15-80C-T01 document.		
Affected Documents Tri-Party Agreement Handbook.		
Approvals ___ Approved ___ Disapproved		
Linda McClain, DOE	Date ______	
Doug Sherwood, EPA	Date ______	
Mike Wilson, Ecology	Date ______	

Background:
For years, appropriate scope and priority for assessments of contaminant impacts to the Columbia River has been controversial. During 1993 the Tri-Parties began work towards a Columbia River Comprehensive Impact Assessment. This effort was established in the Tri-Party Agreement in January 1994. Differences in project participants' expectations are at least partially attributable to the word "comprehensive" in the CRCIA project name and to the description of the project scope for the original M-13-80B milestone. To help establish common expectations, a CRCIA Project Management Team was formed in late August 1995, consisting of the following organizations and representatives:

- (Chair) U. S. Department of Energy, CRCIA Project Manager
- U. S. Environmental Protection Agency, CRCIA Project Manager
- State of Washington, Dept. of Ecology, CRCIA Project Manager
- Yakama Indian Nation, CRCIA Representative
- Confederated Tribes of the Umatilla Indian Reservation, CRCIA Representative
- Nez Perce Tribe, CRCIA Representative
- State of Oregon, CRCIA Representative
- Hanford Advisory Board, CRCIA Representative
- Pacific Northwest National Laboratory (Primary Contractor), CRCIA Project Manager, CRCIA Team Administrator
- Bechtel Hanford, Inc (Environmental Restoration Contractor), CRCIA Technical Coordination Representative, Public Involvement Representative
- Dames & Moore (General Services Support Contractor) - Technical Support Representative

This team began meeting in late August 1995 and continues to meet, one-half day per week, to resolve issues associated with the project. An agreement concerning the scope of the project was agreed-to (and signed) by Team members on October 3, 1995. This agreement is restated on page 3 as "Agreed-to FY 1996 Work" and becomes part of the revised M-15-80 milestone.

Agreed-to FY 1996 Work

The following work, with proactive involvement by the non-TPA members, will be performed in response to TPA Milestone M-15-80:

1) Perform an assessment of Hanford-derived contaminants (existing conditions including residual contaminants from past operations) in a scoping level risk assessment to support IRM decisions.

2) Compile and make available to the public the approximately 2000 documents identified in Appendix A of the data compendium; pertinent supporting Hanford data will be made available.

3) Work with the declassification efforts of the HAB in identifying 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 scoping level risk assessment.

5) Data (from 2&3) will be available for reconciliation against the risk assessment.

These actions are designed to fulfill the requirements for a scoping level risk assessment to support IRM decisions limited only by the time and FY96 funds available for this effort. However, the "comprehensiveness" issue is left open. Work identified under #4 will be assigned TPA milestones as appropriate, scoped, prioritized and scheduled.