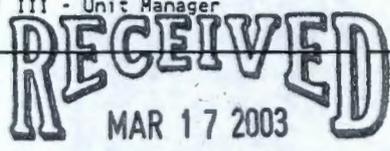


Change Number M-45-93-01	Federal Facility Agreement and Consent Order Change Control Form Do not use blue ink. Type or print using black ink.	Date Jan. 25, 1994																				
Originator S. E. McKinney		Phone (206) 459-6725																				
Class of Change <input checked="" type="checkbox"/> I - Signatories <input type="checkbox"/> II - Project Manager <input type="checkbox"/> III - Unit Manager																						
Change Title Complete Closure of Single Shell Tank Farms *																						
Description/Justification of Change EDMC Establish the following milestones and targets. M-45-00 Complete closure of all single shell tank farms. September 2024 Closure will follow retrieval of as much tank waste as technically possible, with tank waste residues not to exceed 360 cubic feet (cu. ft.) in each of the 100 series tanks, 30 cu. ft. in each of the 200 series tanks, or the limit of waste retrieval technology capability, whichever is less. If the DOE believes that waste retrieval to these levels is not possible for a tank, then DOE will submit a detailed explanation to EPA and Ecology explaining why these levels cannot be achieved, and specifying the quantities of waste that the DOE proposes to leave in the tank. The request will be approved or disapproved by EPA and Ecology on a tank-by-tank basis. Procedures for modifying the retrieval criteria listed above, and for processing waiver requests are outlined in the appendix to this change request. (Continued on next page)																						
Impact of Change This change will create a single milestone for retrieval of single shell tank wastes and closure of the single shell tank farms. It will replace 4 major milestones (M-06, M-07, M-08, M-09). It will add retrieval of tank wastes as a formal requirement for single shell tank closure. The six operable units (tank farms) will be excluded from Milestone M-13-00, M-15-00 and M-16-00.																						
Affected Documents Hanford Federal Facility Agreement and Consent Order Action Plan, Appendix D																						
<table border="0"> <tr> <td colspan="2">Approvals</td> <td style="text-align: center;"><input checked="" type="checkbox"/> Approved</td> <td style="text-align: center;"><input type="checkbox"/> Disapproved</td> </tr> <tr> <td colspan="4">This change form approved by Amendment Four to the Hanford Federal Facility Agreement and Consent Order executed by the signatories on January 25, 1994.</td> </tr> <tr> <td>John Wagoner DOE</td> <td>_____</td> <td>January 25, 1994 Date</td> <td></td> </tr> <tr> <td>Gerald Emison EPA</td> <td>_____</td> <td>January 25, 1994 Date</td> <td></td> </tr> <tr> <td>Mary Riveland Ecology</td> <td>_____</td> <td>January 25, 1994 Date</td> <td></td> </tr> </table>			Approvals		<input checked="" type="checkbox"/> Approved	<input type="checkbox"/> Disapproved	This change form approved by Amendment Four to the Hanford Federal Facility Agreement and Consent Order executed by the signatories on January 25, 1994.				John Wagoner DOE	_____	January 25, 1994 Date		Gerald Emison EPA	_____	January 25, 1994 Date		Mary Riveland Ecology	_____	January 25, 1994 Date	
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Mary Riveland Ecology	_____	January 25, 1994 Date																				

Following completion of retrieval, six operable units (tank farms), as described in appendix C (200-BP-7, 200 PO-3, 200-RO-4, 200-TP-5, 200-TP-6, 200-UP-3), will be remediated in accordance with the approved closure plans. Final closure of the operable units (tank farms) shall be defined as regulatory approval of completion of closure actions and commencement of post-closure actions.

For the purposes of this agreement all units located within the boundary of each tank farm will be closed in accordance with WAC 173-303-610. This includes contaminated soil and ancillary equipment that were previously designated as RCRA past practice units. Adopting this approach will ensure efficient use of funding and will reduce potential duplication of effort via application of different regulatory requirements: WAC 173-303-610 for closure of the TSD units and RCRA Section 3004(u) for remediation of RCRA past practice units.

All parties recognize that the reclassification of previously identified RCRA past practice units to ancillary equipment associated with the TSD unit is strictly for application of a consistent closure approach. Upgrades to previously classified RCRA past practice units to achieve compliance with RCRA or dangerous waste interim status technical standards for tank systems (i.e., secondary containment, integrity assessments, etc.) will not be mandated as a result of this action. However, any equipment modified or replaced will meet interim status standards. In evaluating closure options for Single-Shell Tanks, contaminated soil, and ancillary equipment, Ecology and EPA will consider cost, technical practicability, and potential exposure to radiation. Closure of all units within the boundary of a given tank farm will be addressed in a closure plan for the Single-Shell Tanks.

Waste generated from the closure or remediation of formerly designated past practice units (as specified above) will be handled in accordance with regulatory mechanisms and practices available for past practice units.

This milestone will replace the current Milestones M-06 (Develop Single-Shell Tank waste retrieval technology and complete scale model testing), M-07 (Initiate full scale demonstration of waste retrieval technology), M-08 (Initiate full scale tank farm closure demonstration project), and M-09 (Complete closure of all 149 Single-Shell Tanks). Retrieval of all Single-Shell Tank wastes will be incorporated into this milestone. The new milestone will combine retrieval of tank wastes and closure of the tank farms. It is the intent that the closure standards under RCRA TSD Units and Past Practices will be consistent with closure standards under CERCLA operable units for adjacent waste sites.

M-45-01 Develop single-shell tank (SST) retrieval technology September 1994

Develop single-shell tank waste retrieval technology and complete scale model testing. Various waste retrieval technologies will be evaluated for retrieving each of the several types of single-shell tank wastes. Emphasis will be placed on optimizing waste removal while minimizing personnel exposure. Promising technologies will be evaluated for each waste type and one or more will be selected for testing using simulated waste in a scale model (minimum 1:12 scale) tank.

M-45-02 Submit annual updates to SST Retrieval Sequence Document September 2017

6981-0212146

This provides for an annual update of an SST Retrieval Sequence document that will define the tank selection criteria, tank selection rationale, reference retrieval method(s) for each tank, and the estimated retrieval schedules. The annual updates will be submitted to Ecology for approval.

- 07/01 REVISIONS
- M-45-02A Submit initial SST retrieval sequence document for Ecology approval. September 1996
- M-45-02B-v Submit annual update of SST retrieval sequence document for Ecology approval. September 1997 through September 2017
- M-45-03-T01 Complete SST waste retrieval demonstration September 2003
Initiate and complete a full scale demonstration of SST retrieval technology. This demonstration will be considered complete when no less than 99% of the waste inventory is removed from the tank.
- M-45-03A Initiate sluicing retrieval of C-106 October 1997
Initiate sluicing retrieval of tank 241-C-106 to resolve the high-heat safety issue and demonstrate waste retrieval.
- M-45-03-T02 Initiate final retrieval demonstration of C-106 June 2002
Initiate final retrieval of tank 241-C-106 to complete initial demonstration of SST retrieval technologies.
- M-45-04-T01 Provide Initial Single-Shell Tank Retrieval Systems November 2003
Complete construction and related testing of the initial SST retrieval systems. This milestone will provide retrieval systems for an entire single-shell tank farm or an equivalent number of tanks.
- M-45-04A Complete Conceptual Design for the initial SST retrieval systems. April 1997
- M-45-04-T02 Complete design for the initial SST retrieval systems. December 2000
- M-45-04-T03 Complete construction for the initial SST retrieval systems. June 2003
- M-45-05 Retrieve waste from all remaining Single-Shell tanks September 2018
Complete waste retrieval from all remaining single shell tanks. Retrieval standards and completion definitions are provided under the major milestone. The schedule reflects retrieval activities on a farm-by-farm basis. It also allows flexibility to retrieve tanks from various farms if desired to support safety issue resolution, pretreatment or disposal feed requirements, or other priorities.
- M-45-05-T01 Initiate tank waste retrieval from one single-shell tank. December 2000
- M-45-05-T02 Initiate tank retrieval from two additional single-shell tanks. September 2000

M-45-05-T03	Initiate tank retrieval from three additional single-shell tanks.	September 2005
M-45-05-T04	Initiate tank retrieval from four additional single-shell tanks.	September 2006
M-45-05-T05	Initiate tank retrieval from five additional single-shell tanks.	September 2007
M-45-05-T06	Initiate tank retrieval from five additional single-shell tanks.	September 2008
M-45-05-T07	Initiate tank retrieval from seven additional single-shell tanks.	September 2009
M-45-05-T08	Initiate tank retrieval from eight additional single-shell tanks.	September 2010
M-45-05-T09	Initiate tank retrieval from ten additional single-shell tanks.	September 2011
M-45-05-T10	Initiate tank retrieval from 12 additional single-shell tanks.	September 2012.
M-45-05-T11	Initiate tank retrieval from 14 additional single-shell tanks.	September 2013
M-45-05-T12	Initiate tank retrieval from 17 additional single-shell tanks.	September 2014
M-45-05-T13	Initiate tank retrieval from 20 additional single-shell tanks.	September 2015
M-45-05-T14	Initiate tank retrieval from 20 additional single-shell tanks.	September 2016
M-45-05-T15	Initiate tank retrieval from 20 additional single-shell tanks.	September 2017
M-45-06	Complete closure of all single-shell tank farms	September 2024

The Single-Shell Tank Closure Work Plan will be prepared describing the work integration process for single-shell tank closures and status of work and integration process. Known issues will be identified and an explanation will be given on how these issues are being addressed. This Work Plan will be provide to Ecology for review/comment and will be used as a roadmap for closure of the single-shell tanks. Because of the uncertainties in the closure process, the Work Plan will evolve as these uncertainties are resolved and eventually it will become the SST Closure/Post-Closure Plan(s) issued for Ecology's approval under subsequent TPA interim milestones. Major work areas covered in the Work Plan will include waste retrieval, operable units characterization, technologies development to support closure, regulatory pathway and strategy for achieving closure.

- 7/11/95
- M-45-06-T01 Submit tank closure/post-closure plan for selected closure demonstration operable unit or tank farm to Ecology for approval. November 2004
- M-45-06-T02 Ecology will issue final closure/post closure plan for selected closure demonstration operable unit or tank farm. September 2006
- M-45-06-T03 Initiate closure actions on an operable unit or tank farm basis. Closure shall follow completion of the retrieval actions under proposed milestone M-45-05. Closure will be defined in an approved closure plan for the demonstration farm. Final closure is defined as regulatory approval of completion of closure actions. March 2012
- M-45-06-T04 Complete closure actions on one operable unit or tank farm. March 2014
- M-45-07 Complete Evaluation and Demonstration Testing of Small Scale Sub-Surface Barriers September 1997
- DOE will assess the risk to the environment due to tank waste remediation. DOE with concurrence from Ecology and EPA will evaluate barrier technology as a means to minimize those risks and vendor capabilities to deploy and test barriers in Hanford soils. Retrieval of waste from tank 241-C-106 will proceed without a barrier.
- M-45-07A Complete Evaluation of Sub-Surface Barrier Feasibility September 1994
- Complete a feasibility study of barriers to accomplish the following:
- 1) Estimate the potential environmental impact of waste storage and retrieval activities without the application of barriers.
 - 2) Establish functional requirements of barriers to minimize the impact associated with the waste storage and retrieval activities.
 - 3) Evaluate the application of existing sub-surface barrier technologies to meet functional requirements of barriers and the potential reduction in environmental impacts from the application of barriers to SST waste storage and retrieval activities.
- M-45-07B Reach Decision on Whether to Proceed with Demonstration January 1995
- Based on the results of the sub-surface barrier feasibility study, Ecology, EPA, and DOE will make a decision on whether to proceed with a sub-scale demonstration. If the decision is negative, then interim milestone M-45-07 will be considered complete.
- M-45-07-T01 Establish Performance Criteria and Test Specifications March 1995
- Ecology, EPA, and DOE establish and reach agreement on performance criteria and test specifications to be used for the small scale demonstration of sub-surface barrier technologies.

M-45-07-T02 Initiate Demonstration Testing of Selected Sub-Surface Barrier Technologies October 1995

Testing of one or more small scale sub-surface barrier technologies will be initiated at a Hanford test site. Documentation will be completed prior to testing which will incorporate performance criteria and test specifications. Initiation of demonstration is defined as completion of construction and initiation of test procedures.

M-45-07-T03 Complete Evaluation of Sub-Surface Barrier Demonstration Test March 1997 Results

Test data and related information will be provided to Ecology, EPA, and DOE as it becomes available during testing. Sub-surface barrier technologies will be evaluated against the performance criteria and test specifications.

M-45-07-T04 Reach Decision on Whether to Proceed with Sub-Surface Barrier Program June 1997

Ecology, EPA, and DOE will make a decision on whether to proceed with installation of a full-scale sub-surface barrier to support SST retrieval under milestone M-45-07. If the decision is negative, then milestone M-45-07 will be considered complete.

M-45-07C Establish New Milestones for Sub-Surface Barrier Implementation September 1997

Ecology, EPA, and DOE will negotiate and reach agreement on new milestones to support milestone M-45-07 and a program to install sub-surface barriers in SST farms or individual tanks to support SST retrieval schedules under M-45-00. New milestones will include completion of construction of a full-scale sub-surface barrier in a tank farm, in conjunction with the installation of the retrieval systems pursuant to M-45-04-T03 (complete construction for the initial SST retrieval systems).

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APPENDIX TO CHANGE REQUEST M-45-93-01

Waste Retrieval Criteria Procedure

Introduction:

The purpose of this procedure is to establish a means to set, evaluate, and revise criteria for determining the allowable residual waste following waste retrieval operations on the Hanford single shell tanks (SST).

The format for this procedure is to progress through a series of steps as depicted in the generic logic diagram displayed as Figure 1. Each step is briefly outlined and includes elements that constitute completion of the step.

Definition of terms specific to Waste Retrieval Activities:

Residual Waste: Tank waste remaining in the tank after all waste retrieval actions have been completed. Some materials may be excluded from residual waste volume calculations, subject to approval in the closure plan.

Step 1 : Establish Goal

This initial step establishes the goal (the standard) for waste retrieval percentage and the method to be used to calculate the allowable residual waste volume following completion of retrieval operations. The calculation method is dependent on the variable to be measured (total tank waste inventory), and closure criteria and strategy. The proposed residual waste volume calculation method is shown in Attachment 1. A retrieval goal has been established as defined in milestone M-45-00.

Step 2 : Evaluate Major Assessment Areas

Once the goal has been established, it is assessed against two major areas, which are:

- a) **SST Demonstration:** Demonstrate achievability of waste retrieval goal during tank 241-C-106 tank retrieval demonstrations. These demonstrations will include the reference SST retrieval technologies. The effectiveness of the retrieval operation will be determined with a topographical measurement of remaining waste in the tank, and a calculation of waste inventory. The inventory calculation will be based on calculated volume of the tank, waste topography measurements with appropriate surveying techniques, and include adjustments for any detectable deformities in the tank structure (i.e., liner bulges). This technique will be demonstrated and calibrated in this retrieval demonstration. Prepare input to the retrieval goal evaluation (step 3) to accommodate the retrieval operations and residual measurement demonstrations.

- b) Evaluate requirements of high-level waste (HLW) disposal from DOE Orders and the Nuclear Waste Policy Act (NWPA). Establish an interface with the Nuclear Regulatory Commission (NRC), and reach formal agreement on the retrieval and closure actions for single shell tanks with respect to allowable waste residuals in the tank and soil column. Prepare input to the retrieval goal evaluation (step 3) to accommodate the agreements on allowable residuals.

Step 3 : Tank Retrieval Demonstration Goal Compliance

Perform a joint assessment by DOE, EPA, and Ecology of the retrieval goal, based on the inputs from Steps 1 and 2. Modify the retrieval goal to match the most restrictive case (i.e., the highest retrieval % requirement).

Step 4 : Tank Farm Retrieval Demonstration

Perform the Tank Farm Retrieval Demonstration on the selected tank farm or initial set of single-shell tanks to be retrieved. Repeat the residual inventory measurement steps identified in the tank retrieval demonstration. Calculate the residual inventory for each tank, based on the formula and procedure in Attachment 1.

Step 5 : Tank Farm Retrieval Demonstration Goal Compliance

Perform a joint assessment by DOE, EPA, and Ecology of the retrieval goal, based on the tank farm retrieval demonstration results. Modify the goal to match best available technology. Notify NRC as required for compliance with NWPA. Establish formal criteria for retrieval of waste from the remaining SST's. Finalize closure plans for tank farms and obtain concurrence from regulatory agencies.

Step 6 : SST Retrieval

Proceed with retrieval of waste from the remaining SSTs. The schedule reflects retrieval activities on a tank-by-tank basis. It also allows flexibility to retrieve tanks from various farms if desired to support safety issue resolution, pretreatment or disposal feed requirements, or other priorities. Completion of retrieval will be in accordance with approved closure plans.

Step 7 : Determine Residual Waste Percentage

The waste residuals are calculated for each tank.

Step 8 : Retrieval Compliance Evaluation

Compare residual waste in each tank with criteria. Document compliance with criteria via notification to appropriate regulatory agencies. If residual complies with criteria, proceed with final closure operations (step 14). If residuals do not comply with criteria, prepare a request for waiver to the appropriate regulatory agency (step 9).

Step 9 : Petition for Regulatory Waiver

An assessment is made as to the applicability of petitioning for regulatory waiver. This requires the review of relevant NRC license issues and possible closure plan modifications. Submit waivers to appropriate regulatory agencies.

Step 10 : Waiver Acceptance

If a waiver is accepted, closure operations for the tank farm is initiated (Step 14). If the waiver is not accepted, additional retrieval operations are required. New technology may be needed (step 11). The waiver evaluation will consider the points on Attachment 2.

Step 11 : Additional Technology Available

A review of alternate technologies will be performed relative to additional waste removal. If additional technologies are available, they will be deployed (step 12) and waste retrieval will resume. If additional technologies are not available, new technologies must be developed and deployed (steps 13 and 14). The tank farm will be held in interim status pending completion of the additional retrieval operations.

Step 12 : Deploy Technology and Perform Additional Retrieval

If additional retrieval technology is available, it is deployed and additional waste retrieval operations are performed. After retrieval operation, the waste residual is again determined (Step 7), followed by the tank goal compliance evaluation (Step 8).

Step 13 : Develop New Technology

If additional retrieval technology is not available, new technology is to be developed for the residue waste followed by deployment of the technology and additional waste retrieval operations (Step 12). After retrieval operation, the waste residual is again determined (Step 7), followed by the tank goal compliance evaluation (Step 8).

Step 14 : Closure Action

When the tank farm retrieval and waste residual assessment process is complete the closure operations will start. Completion of the retrieval operations will be documented in accordance with the closure plans.

WASTE RESIDUAL CALCULATION PROCEDURE, STEP 1

Calculate Residual Waste Volume

1. Calculate Tank Volume
2. Measure/Calculate Waste Inventory via Topographical Mapping and Survey Techniques.
3. Retrieve Waste
4. Repeat Step 2.

Calculation Method:

For 75' Diameter Tanks (Full Diameter Tank (x))

$$\text{xbar gal} = \frac{(100-A)\% (\text{Total Volume of Waste}/133 \text{ Tanks})}{\text{in full diameter tanks}} = \frac{\text{Allowable Average Residual}}{\text{per Tank}}$$

where A% * = Goal or criteria for waste retrieval percentage.

For Small Diameter Tank (y)

$$\text{ybar gal} = \frac{(100-A)\% (\text{Total Volume of Waste}/16 \text{ Tanks})}{\text{in small diameter tanks}} = \frac{\text{Allowable Average Residual}}{\text{per Tank}}$$

where A% * = Goal or criteria for waste retrieval percentage.

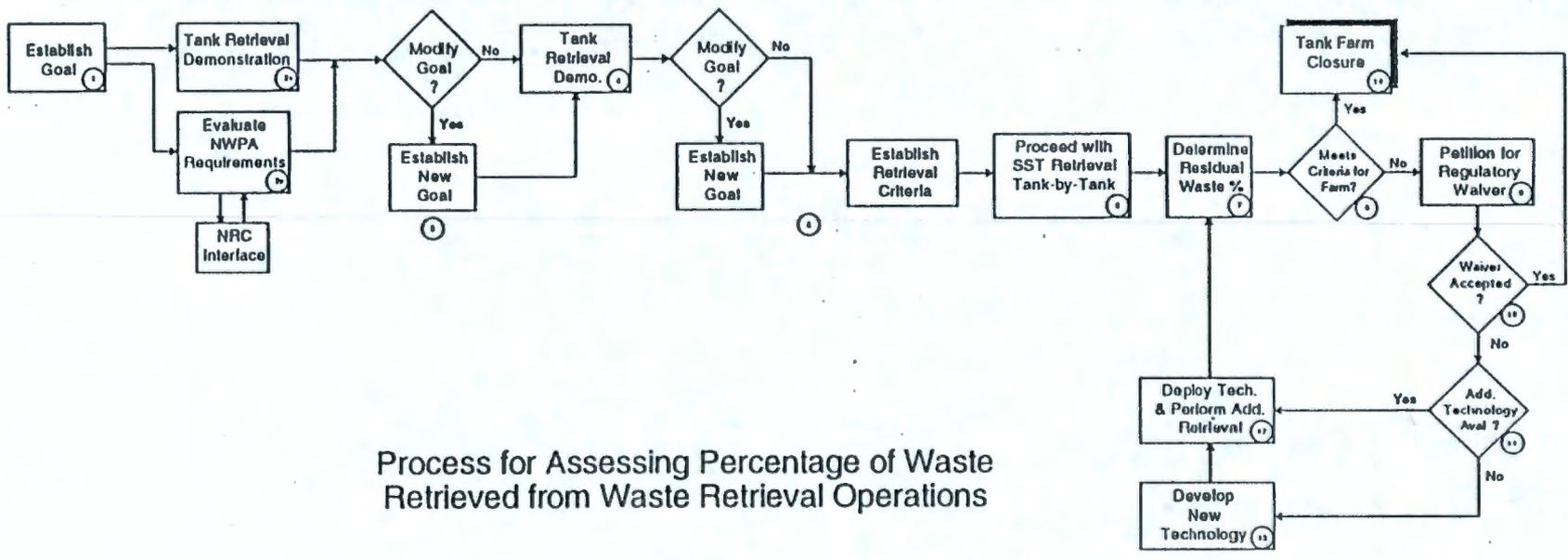
* Goal is 99% waste retrieval as defined in M-45-00 in equivalent volumetric measures.

EXCEPTION TO RETRIEVAL CRITERIA FOR SINGLE-SHELL TANKS

The DOE shall retrieve tank waste in accordance with criteria defined in milestone M-45-00. This recovery criteria will be applied to each tank on a tank-by-tank basis. If the DOE does not believe that this criteria is achievable for a specific tank, DOE shall submit a request for an exception to EPA and Ecology. The request shall include, at minimum, the following information:

1. The reason DOE does not believe the retrieval criteria can be met.
2. The schedule, using existing technology, to complete retrieval to the criteria - if possible.
3. The potential for future retrieval technology developments that could achieve the criteria, including estimated schedules and costs for development and deployment.
4. The volume of waste proposed to be left in place, and it's chemical and radiological characteristics.
5. Expected impacts to human health and the environment if the residual waste is left in place.
6. Additional information as required by EPA and/or Ecology.

The above information shall be submitted within 120 days of the decision by DOE that continued retrieval actions will not result in further waste removal. Upon receipt, EPA and Ecology shall provide a response within 60 days, in which they will either approve the exception to the criteria, in which case retrieval will be considered complete for the tanks in question, or they will deny the request. If the request is denied the DOE must continue to attempt to retrieve the tank wastes until the criteria is met for the tank, or they may choose to enter into the RCRA dispute resolution procedures of the Agreement. If an exception to the criteria is approved, the closure plan for the SSTs must be modified to address the remaining residual waste.



Process for Assessing Percentage of Waste Retrieved from Waste Retrieval Operations

FIGURE 1

IT IS SO AGREED:

Each undersigned representative of a Party certifies that he or she is fully authorized to enter into this Agreement and Action Plan and to legally bind such Party to this Agreement and Action Plan. These change requests and amendments shall be effective upon the date on which this amendment agreement is signed by the Parties. Except as amended herein, the existing provisions of the Agreement shall remain in full force and effect.

FOR THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY:

Gerald Emison
Gerald Emison
Acting Regional Administrator
Region 10
U.S. Environmental Protection Agency

1-25-94
Date

FOR THE UNITED STATES DEPARTMENT OF ENERGY:

John D. Wagoner
John Wagoner
Manager
U.S. Department of Energy
Richland Operations Office

1/25/94
Date

FOR THE WASHINGTON STATE DEPARTMENT OF ECOLOGY:

Mary Riveland
Mary Riveland
Director
State of Washington
Department of Ecology

1/25/94
Date