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Addendum

Addendum to the Focused Feasibility Study for the K Basins Interim Remedial Action

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

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Department of Energy
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EXECUTIVE SUMMARY

The *Focused Feasibility Study for the K Basins Interim Remedial Action,* DOE/RL-98-66, Revision 0, and the follow-on *Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Interim Remedial Action Record of Decision* (ROD) were issued in 1999. Since then, new sludge characterization data, sludge treatment processes information, and waste lifecycle management information have become available that facilitate new remedy alternatives that better address K Basin remedial action objectives. This *Addendum to the Focused Feasibility Study for the K Basins Interim Remedial Action* uses this information as a basis for selection of different remedy alternatives for sludge treatment and debris management than those selected by the 1999 K Basins ROD. This Addendum addresses only the sludge treatment and debris management actions for which the 1999 ROD remedy has been re-evaluated and does not revisit the 1999 ROD remedies for removal and drying of spent nuclear fuel or for removal and treatment of contaminated basin water. This Addendum presents new Sludge Alternative 2 and new Debris Alternative 2 that are analyzed against the nine CERCLA alternative evaluation criteria and then compared with the remedy for sludge and debris selected by the 1999 ROD. This Addendum will be the basis for the new *Proposed Plan for an Amendment to the K Basins Interim Remedial Action Record of Decision*, DOE/RL-2004-48, Revision 0, that will undergo public comment in support of an amendment to the 1999 ROD for these changes. This Addendum also performs the administrative function of updating the applicable or relevant and appropriate requirements to reflect current workscope and requirements.

New Sludge Alternative 2 has treatment as the primary component but does not change the treatment technologies evaluated in the 1999 ROD. This alternative eliminates the interim storage of untreated sludge identified in the 1999 ROD and integrates sludge treatment and removal activities while identifying treatment criteria and treatment location. The details of sludge treatment systems and treatment criteria will be contained in a modification of the *Remedial Design Report/Remedial Action Work Plan* (DOE/RL-99-89) for this action. Under this alternative, sludge would be treated soon after removal for disposal at an off-Hanford Site unit as radioactive waste. The most likely initial sludge for treatment is the 105-K East North Loadout Pit sludge which may be managed as a treatability study. KE North Loadout Pit sludge would be removed from the KE Basin and transported to T Plant Complex, an operating 200 West Area treatment facility, for treatment for disposal by solidification. As necessary, capacity for short-term, contingency storage of treated and/or untreated sludge ('lag storage') would be available at a 200 Areas storage facility if treatment or disposal delays occur. Alternative 2 reflects the remedial action objective to treat sludge as soon as possible after removal and the statutory preference for remedies that have treatment as a primary element. Treatment also significantly accelerates sludge stabilization and elimination of risk and cost associated with the administrative and engineered controls for interim storage of untreated sludge.

Under new Debris Alternative 2, some K Basins debris would be removed but much would be left in the basins for disposition in conjunction with K Basin Deactivation activities. The debris planned to be left in the basins would include the debris from below the basin waterline (racks, steel canisters, processing equipment). In conjunction with K Basin Deactivation, the basins would be filled with cement-based grout to a level that would provide appropriate radiological shielding of contaminated basin wall and floor surfaces and that would also encapsulate the remaining debris in the grout matrix. Removal of the encapsulated debris is addressed under M-34 Tri-Party Agreement milestones. Leaving some debris in the basins and then encapsulating the remaining debris in grout would greatly reduce debris decontamination and management activities, thereby speeding cleanup time and reducing costs and radiological exposure.

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APPENDIX

FIGURES

TABLES

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GLOSSARY

Addendum	Addendum to the Focused Feasibility Study
AEA	*Atomic Energy Act of 1954*
ALARA	As Low As Reasonably Achievable
ARAR	applicable or relevant and appropriate requirement
BACT	best available control technology
BARCT	best available radionuclide control technology
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	Code of Federal Regulations
CH	contact-handled (waste)
Ci/cm^3	curies per cubic centimeter
CSB	Canister Storage Building
CVD	Cold Vacuum Drying
CWC	Central Waste Complex
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DQO	data quality objective
DST	double-shell tank
Ecology	Washington State Department of Ecology
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ETF	200 Areas Effluent Treatment Facility
FGE	fissile gram equivalent
FFS	Focused Feasibility Study
FFS-O	*Feasibility Study for the K Basins Interim Remedial Action* (DOE/RL-98-66, Rev. 0)
g/cm^3	grams per cubic centimeter
HLW	high-level waste
IWTS	Integrated water treatment system
KE	K East (Basin)
KOP	knock out pots
KW	K West (Basin)
LDC	large diameter container
LDR	land disposal restriction
LLW	low-level waste
m^3	cubic meter
MCO	multi-canister overpack

MEI	maximally exposed individual
mg	milligram
mg/kg	milligram per kilogram
NEPA	*National Environmental Policy Act of 1969*
NLOP	North Loadout Pit
NOC	notice of construction
NRC	U.S. Nuclear Regulatory Commission
Pa	Pascal
PCB	polychlorinated biphenyl
PNNL	Pacific Northwest National Laboratory
PP	proposed plan
ppm	parts per million
QA	quality assurance
RAO	remedial action objectives
RAWP	Remedial Action Work Plan
RDR	Remedial Design Report
RH	remote-handled (waste)
ROD	record of decision
SNF	spent nuclear fuel
SRDP	Sludge Retrieval and Disposal Project
TBC	to be considered
TCLP	toxicity characteristic leaching procedure
TCRA	Time Critical Removal Action
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRU	transuranic
TSCA	*Toxic Substances Control Act of 1976*
WAC	waste acceptance criteria
WDOH	Washington State Department of Health
WIPP	Waste Isolation Pilot Plant
wt %	weight percent
W/mK	W/mK = Watts/meter-Kelvin

ADDENDUM TO FOCUSED FEASIBILITY STUDY FOR THE K BASINS INTERIM REMEDIAL ACTION

1.0 INTRODUCTION

This section identifies the purpose, scope, and organization of this Addendum to the Focused Feasibility Study for the K Basins Interim Remedial Action (Addendum).

1.1 PURPOSE

The *Focused Feasibility Study for the K Basins Interim Remedial Action,* DOE/RL-98-66, Rev. 0, (FFS) was issued in 1999. The 1999 FFS, served to identify the requirements under *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) *of 1980* for remediation at the K East (KE) and K West (KW) Basins to mitigate threats from basin contents. Since issuance in 1999 of the FFS and the *CERCLA Record of Decision (ROD) for the K Basins Interim Remedial Action* (EPA 1999), new sludge characterization data, sludge treatment processes information, and waste lifecycle management information have become available. This information facilitates new remedy alternatives that better address K Basin remedial action objectives (RAO). This Addendum to the 1999 FFS has been prepared to respond to this new information and serves as the basis for amending the 1999 CERCLA ROD for this action. This Addendum has been prepared pursuant to CERCLA requirements to evaluate alternatives and implementing requirements [40 Code of Federal Regulations (CFR) 300]. The new remedy alternatives will be presented for public review and comment in a new *Proposed Plan for an Amendment to the K Basins Interim Remedial Action Record of Decision,* DOE/RL-2004-48, Revision 0, (Proposed Plan). After public comment, the selected remedies will be identified by U.S. Department of Energy and the U.S. Environmental Protection Agency (EPA) in an amendment to the K Basins Interim Remedial Action ROD.

The K Basins Environmental Impact Statement (EIS) (DOE/EIS-0245F) and the 1996 *National Environmental Policy Act* (NEPA) *of 1969* Record of Decision (ROD) (40 FR 10736) evaluated the environmental impacts of alternatives for management of spent nuclear fuel (SNF) stored in the basins. Each SNF alternative included sludge and debris management. The 1999 FFS, Appendix A, provided an integrated NEPA values analysis of SNF disposition alternatives. The 1999 FFS NEPA analysis was built on the previous EIS analysis of SNF alternatives because the actions for sludge removal and handling have similar impacts to those for SNF, although on a smaller scale. The new sludge and debris remedy alternatives evaluated in this Addendum are an extension of alternatives evaluated for environmental impact in the 1999 FFS. These remedy alternatives identify no new environmental impacts and do not change the NEPA evaluation provided in the 1999 FFS.

1.2 ADDENDUM SCOPE

Activities completed by the K Basins CERCLA Interim Remedial Action would prepare the K Basin structures for removal under the 100 Areas Remaining Sites ROD (EPA et al. 1996). The scope of the K Basins interim remedial action that is the subject of this FFS Addendum is as follows:

- Treating and packaging sludge to meet waste acceptance criteria (WAC) for disposal at an off-Hanford Site facility (subject of this Addendum)

- Removing some debris, processing (e.g., rinsing, void space removal) as necessary to facilitate disposal at ERDF or another waste management facility (subject of this Addendum)

- Grouting remaining debris in the basins in preparation for basin demolition and removal (subject of this Addendum).

The scope of K Basins CERCLA activities evaluated in this Addendum includes sludge treatment and packaging actions for off-Hanford Site disposal and debris management actions for which the 1999 CERCLA ROD remedy will be changed. This Addendum does not revisit the 1999 ROD remedy for SNF removal and drying and for removal and treatment of contaminated basin water. This Addendum also describes basin deactivation and removal activities with which the debris alternative would be integrated. Demolition and removal of the basin structures will be conducted under the 100 Areas Remaining Sites ROD. This Addendum also updates, as necessary, remedial action applicable or relevant and appropriate requirements (ARARs) to reflect current requirements. ARARs in the 1999 ROD will remain ARARs in the proposed amended ROD. Additional ARARs resulting from the expanded scope and revisions to the prior selected remedy are identified in Table A-1.

1.3 ORGANIZATION

This Addendum is organized as follows:

- Section 1.0 – introduces this Addendum to the Focused Feasibility Study for the K Basins Interim Remedial Action

- Section 2.0 - provides background information, identifies previously selected remedies, basis for remedy re-evaluation, and establishes the objectives and requirements for this action

- Section 3.0 - defines waste streams requiring disposition and describes new sludge and debris remedies

- Section 4.0 – describes new sludge and debris remedy alternatives

- Section 5.0 - provides a detailed evaluation of alternatives individually against the CERCLA criteria

- Section 6.0 - provides a comparative evaluation of alternatives in the context of CERCLA criteria

- Section 7.0 provides references.

2.0 BACKGROUND

This section identifies the remedy alternatives previously selected by the 1999 CERCLA ROD for sludge and debris, the basis for remedy alternative re-evaluation, and K Basins RAOs.

The basins contain SNF and contaminated sludge, water, and debris. The basins are deteriorating under current storage conditions to the extent that leaks of contaminated water have been recorded to underlying soil and groundwater. The 1999 FFS identified the requirements under CERCLA for conducting certain basin cleanout activities to mitigate these concerns. Although the 1999 FFS identified technology alternatives for treatment of K Basins sludge, it did not recommend a particular treatment methodology. The 1999 ROD identified an additional alternative consisting of doing minimal treatment of sludge necessary to support storage in existing 200 Area facilities. Treatment for disposal was to occur outside the scope of the interim action. This Addendum provides a new sludge remedy alternative integrating sludge treatment and packaging for off-Hanford Site disposal with sludge removal from the basins. More detailed Hanford Site information and K Basin description and history are contained in the 1999 FFS.

2.1 PREVIOUSLY SELECTED REMEDIES

Sludge and debris remedies previously selected by the 1999 CERCLA ROD are summarized in this section. This section also summarizes the previous Basin Deactivation remedy with which the new debris management remedy, if selected, would be integrated.

2.1.1 Previous Sludge Remedy

The previous remedy for sludge was a portion of the remedy for the entire K Basins interim remedial action identified in the 1999 ROD. Under this remedy, approximately 51 cubic meters (m^3) of sludge would be removed from the basins, containerized, and transferred to an approved 200 Area facility for interim storage to await future treatment outside the scope of the interim remedial action. This alternative included minimal treatment to support interim storage or disposal in existing 200 Areas facilities. The beginning of interim storage ended the interim remedial action for sludge. This Addendum identifies the ROD-selected alternative as Sludge Alternative 1 (No Change from the ROD) that equates to the mandatory No Action alternative for CERCLA evaluation.

2.1.2 Previous Debris Remedy

The previous debris remedy was also a portion of the remedy for the entire K Basins interim remedial action identified in the 1999 ROD. Under this remedy above- and below-water debris, including equipment that is not an integral part of the basin structure, would be removed with no allowance for leaving any debris in the basins for later disposition. On removal, all debris was to be treated as necessary for disposal at ERDF. Debris not meeting ERDF WAC would be transferred to an existing permitted waste management facility for storage or further treatment for disposal. This remedy is identified in this Addendum as Debris Alternative 1 (No Change from ROD) and equates to the mandated No Action Alternative for CERCLA alternative evaluations.

2.1.3 Previous Basin Deactivation Remedy

After removal of SNF, sludge, water, and debris, the basins will be deactivated. Deactivation activities were to include removal of equipment not integral to the basin structure, removal of additional hazardous material, and placing the basins in a safe and stable condition requiring a minimum of surveillance and maintenance. The basins would remain in this configuration until future demolition and disposal in accordance with the schedule and methods of the 100 Areas Remaining Sites ROD.

2.2 BASIS FOR REMEDY RE-EVALUATION

Since issuance of the FFS and the CERCLA ROD in 1999, new sludge characterization data, sludge treatment processes information basin characterization data and lifecycle management information have become available making re-evaluation of the sludge remedy appropriate. In addition, improvements on how to manage the debris and accelerate the basin decontamination and removal have come to light and are addressed in this Addendum. This new information facilitates remedy alternatives that better address RAOs for sludge and debris.

2.2.1 Re-Evaluation Basis for Sludge Remedy

Sludge characterization and waste lifecycle planning information that has become available since 1999 has helped determine a revised disposition path for K Basin sludge. New remedies are driven more by new sludge characterization data identifying uranium metal concentrations, chemical properties, and waste designation status, than by the emergence of new treatment technology information.

2.2.1.1 Waste Lifecycle Planning Information

Information regarding waste lifecycle planning and programmatic considerations for storage of untreated sludge at T Plant Complex has become available since 1998. Information now available includes lifecycle costs associated with the management of the untreated sludge, that includes lifecycle costs for sludge packaging into large diameter containers (LDCs), LDC transport to T Plant, interim storage in T Plant cells, and future retrieval of LDCs from T Plant storage for transport to a sludge treatment facility. These costs have been shown to be greater than the cost of treating the sludge into a waste form suitable for disposal following retrieval. When considered with the inherent risk of storing the untreated sludge, the lifecycle costs encourage a new sludge disposition approach.

2.2.1.2 Sludge Characterization Background

Figure 2-1 summarizes the nature of sludge characterization activities from 1994 to the present. Sludge characterization has been driven by the need to support the particular sludge disposition pathway being considered at the time. Since 1994, three distinct basin sludge disposition paths have been considered. Each path mandated required characterization parameters for design of processing equipment and methods. From 1994 through 1998, characterization data focused on obtaining information necessary to process sludge for storage at double-shell tanks and eventual treatment at the Hanford Site vitrification facility. From 1998 through 2003, the characterization was to support sludge removal from the Basins and long-term interim storage of untreated sludge at T Plant Complex until treatment for disposal at a future, unspecified date. The 1999 FFS evaluation of alternatives used characterization data obtained from sampling campaigns performed from 1994 to 1998 to support this long-term interim storage approach. As more characterization data provided better understanding of sludge properties, project objectives were revised and alternatives to storage of untreated sludge became clearer. Consequently, since 2003, characterization has been in support of sludge treatment for CWC storage until offsite disposal as radioactive waste.

Characterization activities have included sampling and analysis activities for the following:

- Characterizing previously uncharacterized sludge streams from KE Basin
- Toxicity characteristic leaching procedure (TCLP) analyses for the KE Basin sludge streams
- Identifying the quantity and behavior of reactive uranium metal in select sludge streams using previously unavailable testing methods
- Evaluation of sludge thermal conductivity for storage determinations and of shear or yield strength for behavior of entrained generated gas bubbles during handling
- Sampling and laboratory characterization of potential disposal waste forms for the KE Basin North Loadout Pit (NLOP) sludge leading to selection of a grouting as the processing method

2.2.1.3 Characterization from 1998 to Present

The primary objectives of sludge characterization since 1998 have been obtaining information regarding sludge chemical, physical, and radiological properties. These data were used to verify sludge properties and identify the hazards of managing the sludge. Sludge has been characterized as a polychlorinated biphenyl (PCB) remediation waste in addition to being radioactive waste. New characterization data confirms treated NLOP sludge would meet waste acceptance criteria for off-Hanford Site disposal as contact-handled (CH) TRU waste.

2.2.1.3.1 Chemical and Physical Properties

Sludge sampling campaigns completed in 1999 provided new sludge characterization data for the previously unsampled Dummy Elevator Pit and Tech View Pit. Sample material was used for analyses to compliment limited data previously taken on sludge from the KE Basin NLOP sludge. The revised estimated composition for the K Basin sludge are provided in Tables 2-1 and 2-2 (derived from HNF-SD-SNF-TI-009) for inventory of KE Basin and KW Basin sludge respectively. The tables provide estimates of nominal expected parameters for the various sludge streams including physical parameters, composition, and radionuclides.

2.2.1.3.2 Toxicity Characterization Leaching Procedure Analysis

The 1999 FFS identified a potential for this waste to be a hazardous waste for total cadmium, chromium, and lead. Sludge also would be regulated as a PCB remediation waste under *Toxic Substances Control Act* (TSCA) *of 1976*. As part of the characterization campaign, TCLP analyses were performed at two different laboratories on composite sludge samples drawn from KE Basin in 1999. The data result (DOE-RL 2000) confirmed that the sludge would not be designated as 'dangerous waste'. Because, at this time the waste was identified as predominantly TRU, the sludge disposition pathway focused on disposal at an off-Hanford Site unit.

2.2.1.3.3 Measurement of Reactive Uranium Metal Through Gas Generation Analyses

The quantity of uranium metal present in various sludge streams is a sludge hazard requiring mitigation for transport, storage, and treatment. Uranium content of streams generally drives treatment methodology. Uranium metal is reactive and oxidizes in the presence of water while generating heat, hydrogen gas, and increases in volume as density changes. Starting in 1999, laboratory analyses were performed to measure the amount of uranium metal present in the K Basin sludge samples. In 1999, a special apparatus previously used to monitor gas generation in onsite tank waste samples was used to quantify the amount of uranium metal present in the K Basin sludge by monitoring gas generation and release during the oxidation of the uranium metal. A series of three gas generation testing campaigns were run using K Basin floor sludge samples and crushed SNF to simulate sludge that would be generated by future fuel washing activities (SNF-7765). Table 2-3, taken from supporting project databook (HNF-SD-SNF-TI-015), provides a summary of the resulting conservative estimates of uranium metal in the various sludge streams as used in the engineering design basis.

2.2.1.3.4 Thermal Conductivity and Shear Strength

Thermal conductivity and yield (or shear) strength of the as-settled sludge are a concern because these are important to calculations of behavior during handling and were significant uncertainties in 1999. Thermal conductivity of the sludge is a concern because thermal calculations for transport and storage must consider reaction of the uranium metal present that further increases temperatures, further increasing reaction rates.

Yield or shear strength is a concern because of the potential for gas generated in the sludge to be held up in the matrix as bubbles. Bubbles potentially could collect forming a larger spanning bubble that could mobilize sludge materials within the storage container. Special methods to measure both these properties were developed (SNF-7765).

Table 2-4 provides the resulting design basis values developed for all the sludge streams taken from the project databook (HNF-SD-SNF-TI-015).

2.2.1.3.5 Recent Characterization of KE Basin NLOP sludge for Treatment for Disposal

Sludge in KE Basin NLOP was sampled in December 2003 for laboratory analysis. A representative core sample of the sludge was provided to Pacific Northwest National Laboratory (PNNL) where the sample was analyzed and evaluated to provide base information for selection of the best waste form. This characterization also provided additional data to complete the design of equipment and methods to handle the processing steps for the sludge to the final waste form. Characterization results generally confirmed the final recommended grouted waste form for the KE Basin NLOP sludge (Mellinger et al. 2004).

2.2.2 Re-Evaluation Basis for Debris Remedy

Since 1999, basin characterization data has become available that has facilitated deactivation planning. This has identified a means of integrating basin debris management with basin deactivation in a manner that reduces cost and exposure from debris while allowing accelerated removal of the basins. Planning for the removal of basin debris and deactivation of the basin showed that there had been significant migration of cesium-137 into the uncoated concrete surfaces of the 105-K East Basin. This was confirmed by underwater measurements of radioactivity on bare concrete surfaces on the floor and walls of the basin. These concrete surfaces would have to be removed or shielding put in place to reduce the radiation exposure to allowable limits during basin dewatering. Therefore, considering the radiological hazards that would be experienced during dewatering and goals for keeping occupational radiological exposures as low as reasonably achievable (ALARA), a scheme of grouting the bottom of the basin that also would encapsulate debris left place was selected as the means of deactivating the basins. As the basins already were scheduled to be removed by 2012 (Tri-Party Agreement Milestone M-016-53), a means of removing the encapsulated debris along with the basin structure was shown to have life cycle cost savings as well as ALARA benefits by keeping occupational radiological exposures low.

2.3 K BASIN REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) establish the objectives and required results of this K Basins interim remedial action. RAOs are based on the nature and extent of contamination, associated risks, and compliance with ARARs (Appendix A). RAOs have not changed from those identified in the 1999 ROD and are as follows:

- Reduce the potential for future releases of hazardous substances from K Basins to the environment:
  - Remove hazardous substances from K Basins near the Columbia River in a safe and timely manner
  - Provide for safe treatment, storage, and final disposal of the SNF, sludge, water, and debris removed from K Basins
  - Prevent further deterioration of SNF.
- Reduce occupational radiation exposure to workers at the basins
- Address the sludge management concerns identified in [ROD, Part V] Section 5.2.1
- Develop the most cost effective sitewide approach, consistent with the CERCLA nine criteria, for treatment, storage, and disposal of sludge
- Treat, store, and/or dispose sludge soon after removal.

Achievement of RAOs is discussed in Section 6.0.

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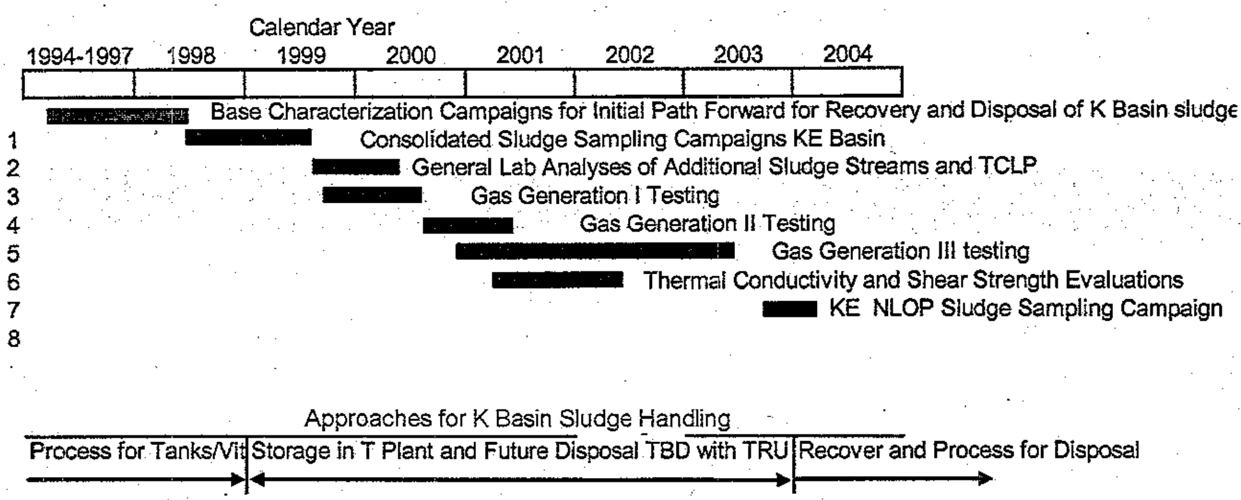

Figure 2-1. Overlay of Sludge Characterization Activities with Sludge Disposition Alternatives.

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Table 2-1. Estimated Inventory for KE Sludge Locations Revised for 1999 Sampling Campaign (4 sheets).

	Units	Weasel Pit	Main Basin Floor	Tech View	North Loadout Pit	Dummy Elevator Pit	Canisters Empty
Nominal Volume of As-settled Sludge	m^3	10.1	21.5	0.400	6.30	1.40	0.400
As-settled Sludge Density (g settled/cm^3 settled)	g/cm^3	1.54	1.27	1.25	1.27	1.33	1.15
Average Water Content	vol%	58	70	71	87	58	71
As-settled Sludge Solid Content (g dry solids/cm^3 as settled sludge)	g/cm^3	0.962	0.570	0.541	0.397	0.752	0.437
Nominal Mass of As-settled Sludge	Mg	15.6	27.3	0.500	7.98	1.86	0.460
Nominal Mass of Dry Sludge	Mg	9.72	12.25	0.217	2.50	1.053	0.175
As-settled Sludge Chemical Composition							
Ag_2O	g/cm^3	--	1.66E-05	--	--	--	1.10E-05
$Al(OH)_3$	g/cm^3						
Al_2O_3	g/cm^3	6.35E-02	8.51E-02	3.54E-02	1.42E-02	6.37E-02	8.51E-02
BaO	g/cm^3	3.56E-04	1.65E-04		9.68E-05	9.56E-05	7.85E-05
CaO	g/cm^3	1.73E-02	5.05E-03	1.80E-03	4.04E-03	3.67E-03	1.24E-03
CdO	g/cm^3	4.83E-05	9.47E-05	7.09E-05	5.31E-05	6.06E-05	8.24E-05
Cr_2O_3	g/cm^3	1.44E-03	5.14E-04	8.50E-04	1.53E-04	6.42E-04	4.53E-04
FeO(OH)	g/cm^3	4.52E-01	2.29E-01	3.14E-01	3.96E-02	2.79E-01	1.61E-01
PbO	g/cm^3	5.50E-04	2.79E-04	6.29E-04	1.05E-04	8.48E-04	3.02E-04
Se	g/cm^3						
Umetal	g/cm^3	1.18E-02	1.38E-03	1.70E-04	8.42E-05	1.81E-04	3.25E-03
UO_2	g/cm^3	2.70E-02	3.04E-02		7.71E-03	1.08E-02	7.15E-02
U_3O_7	g/cm^3	2.75E-02	3.10E-02		7.87E-03	1.10E-02	7.30E-02
$UO_4 \cdot 4H_2O$	g/cm^3			3.90E-02			
UH_3	g/cm^3						
Residual solids	g/cm^3	2.61E-01	1.05E-01		8.36E-02		
CO_2	g/cm^3	7.78E-03	7.92E-03			4.63E-03	5.50E-03
C	g/cm^3	2.47E-03	1.72E-03			2.59E-03	2.78E-03
PCB	g/cm^3	1.14E-04	4.80E-05	9.29E-05	9.41E-05	9.88E-05	7.83E-07
OIER	g/cm^3		5.86E-02		6.00E-02		
Zeolite	g/cm^3	2.84E-02	4.44E-03				
Zircolloy 2	g/cm^3						
Grafoil	g/cm^3						
^{238}Pu	g/cm^3	9.92E-08	1.20E-07	6.70E-08	3.18E-08	1.71E-08	1.21E-07
^{239}Pu	g/cm^3	1.10E-04	1.33E-04	7.80E-05	3.56E-05	1.77E-05	1.17E-04
^{240}Pu	g/cm^3	1.65E-05	1.99E3-05	1.17E-05	5.33E-06	2.66E-06	1.76E-05
^{241}Pu	g/cm^3	1.96E-06	2.37E-06	1.39E-06	6.33E-07	3.16E-07	2.09E-06
Balance	g/cm^3	6.09E-02	8.45E-03	1.49E-01	1.79E-01	3.75E-01	3.24E-02
Radionuclide content							
^{241}Am	µCi/cm^3	8.33E+00	1.22E+01	6.06E+00	2.72E+00	1.39E+00	9.08E+00
^{237}Np	µCi/cm^3	1.76E-03	3.67E-03				2.16E-02
^{238}Pu	µCi/cm^3	1.70E+00	2.05E+00	1.15E+00	5.45E-01	2.93E-01	2.08E+00

Table 2-1. Estimated Inventory for KE Sludge Locations Revised for 1999 Sampling Campaign (4 sheets).

	Units	Weasel Pit	Main Basin Floor	Tech View	North Loadout Pit	Dummy Elevator Pit	Canisters Empty
Nominal Volume of As-settled Sludge	m^3	10.1	21.5	0.400	6.30	1.40	0.400
As-settled Sludge Density (g settled/cm^3 settled)	g/cm^3	1.54	1.27	1.25	1.27	1.33	1.15
Average Water Content	vol%	58	70	71	87	58	71
As-settled Sludge Solid Content (g dry solids/cm^3 as settled sludge)	g/cm^3	0.962	0.570	0.541	0.397	0.752	0.437
Nominal Mass of As-settled Sludge	Mg	15.6	27.3	0.500	7.98	1.86	0.460
Nominal Mass of Dry Sludge	Mg	9.72	12.25	0.217	2.50	1.053	0.175
As-settled Sludge Chemical Composition							
^{239}Pu	$\mu Ci/cm^3$	6.85E+00	8.26E+00	4.85E+00	2.21E+00	1.10E+00	7.30E+00
^{240}Pu	$\mu Ci/cm^3$	3.76E+00	4.54E+00	2.66E+00	1.21E+00	6.06E-01	4.01E+00
^{241}Pu	$\mu Ci/cm^3$	2.02E+02	2.44E+02	1.43E+02	6.52E+01	3.25E+01	2.15E+02
^{60}Co	$\mu Ci/cm^3$	1.28E+00	9.98E-01	5.06E-01	4.09E-01	1.26E+00	9.65E-01
^{137}Cs	$\mu Ci/cm^3$	2.48E+02	2.52E+02	5.43E+01	1.40E+01	2.98E+01	1.09E+02
^{134}Cs	$\mu Ci/cm^3$	1.41E-01	6.03E-02		1.11E-02		
^{152}Eu	$\mu Ci/cm^3$	1.33E-01	1.09E-01				
^{154}Eu	$\mu Ci/cm^3$	1.16E+00	1.92E+00	5.09E-01	5.64E-01	1.10E-01	1.48E+00
^{155}Eu	$\mu Ci/cm^3$	5.36E-01	9.44E-01	2.11E-01	3.29E-01		9.46E-01
$^{89/90}Sr$	$\mu Ci/cm^3$	1.98E+02	1.88E+02	4.69E+00	2.49E+00	3.90E+00	1.96E+01
^{99}Tc	$\mu Ci/cm^3$						1.19E+01
Uranium Composition							
U	kg	5.96E+02	1.18E+03	1.00E+01	8.62E+01	2.70E+01	5.18E+01
^{233}U	mass%						
^{234}U	mass%	7.01E-03	6.55E-03		6.85E-03		7.87E-03
^{235}U	mass%	6.98E-01	7.16E-01	7.18E-01	7.03E-01	7.10E-01	6.96E-01
^{236}U	mass%	8.02E-02	7.62E-02	9.12E-02	7.71E-02	9.01E-02	7.45E-02
^{238}U	mass%	9.92E+01	9.92E+01	9.92E+01	9.92E+01	9.92E+01	9.92E+01

Table 2-1. Estimated Inventory for KE Sludge Locations Revised for 1999 Sampling Campaign (4 sheets).

	Units	Canisters Full	Fuel Wash-Coating	Fuel Wash-Internal Sludge	Fuel Wash-Fuel Piece Slurry	**KE Basin Totals**	Units
Nominal Volume of As-settled Sludge	m^3	3.00	0.0925	0.492	0.155	43.8	m^3
As-settled Sludge Density (g settled/cm^3 settled)	g/cm^3	1.87	1.32	2.97	10.5		
Average Water Content	vol%	09	70	70	40		
As-settled Sludge Solid Content (g dry soids/cm^3 as settled sludge)	g/cm^3	1.18	0.618	2.27	10.1		
Nominal Mass of As-settled Sludge	Mg	5.62	0.122	1.46	1.63	62.5	Mg
Nominal Mass of Dry Sludge	Mg	3.54	0.0572	1.12	1.56	32.2	Mg
As-settled Sludge Chemical Composition							
Ag_2O	g/cm^3	1.40E-04	--	--	--	7.80E-01	kg
$Al(OH)_3$	g/cm^3	1.32E-01	1.37E-01	2.50E-02		4.20E+02	kg
Al_2O_3	g/cm^3					2.70E+03	kg
BaO	g/cm^3	1.83E-04	3.75E-04	3.52E-04		8.68E+00	kg
CaO	g/cm^3	1.93E-03	9.52E-03			3.22E+02	kg
CdO	g/cm^3	3.92E-05				3.12E+00	kg
Cr_2O_3	g/cm^3	2.82E-04	4.61E-04	5.75E-04		2.91E+01	kg
FeO(OH)	g/cm^3	4.02E-02	1.83E-02	4.28E-03		1.05E+04	kg
PbO	g/cm^3	3.04E-04				1.47E+01	kg
Se	g/cm^3						kg
Umetal	g/cm^3	3.92E-02			9.37E+00	1.72E+03	kg
UO_2	g/cm^3	3.93E-01		2.15E+00		3.26E+03	kg
U_3O_7	g/cm^3	4.01E-01				2.24E+03	kg
$UO_4{\cdot}4H_2O$	g/cm^3		5.93E-01			7.05E+01	kg
UH_3	g/cm^3	3.97E-02		2.13E-01		2.24E+02	kg
Residual solids	g/cm^3					5.42E+03	kg
CO_2	g/cm^3	5.59E-03				2.74E+02	kg
C	g/cm^3	1.10E-03				7.01E+01	kg
PCB	g/cm^3	3.67E-07				2.96E+00	kg
OIER	g/cm^3	1.12E-02				1.67E+03	kg
Zeolite	g/cm^3					3.82E+02	kg
Zircolloy 2	g/cm^3				6.60E-01	1.02E+02	kg
Grafoil	g/cm^3						kg
^{238}Pu	g/cm^3	1.35E-06	5.96E-07	3.97E-06	2.90E-05	1.44E-02	kg
^{239}Pu	g/cm^3	1.43E-03	6.13E-04	4.62E-03	1.53E-02	1.33E+01	kg
^{240}Pu	g/cm^3	2.15E-04	9.84E-05	7.58E-04	2.30E-03	2.03E+00	kg
^{241}Pu	g/cm^3	2.55E-05	7.14E-06	5.75E-05	2.73E-04	2.24E-01	kg
Balance	g/cm^3	1.11E-01	-1.41E-01	-1.32E-01	3.56E-02	2.78E+03	kg
Radionuclide content							
^{241}Am	$\mu Ci/cm^3$	1.12E+02	5.77E+01	4.78E+02	1.69E+03	1.21E+03	Ci
^{237}Np	$\mu Ci/cm^3$	1.54E-02			2.48E-01	1.90E-01	Ci
^{238}Pu	$\mu Ci/cm^3$	2.31E+01	1.02E+01	6.80E+01	4.97E+02	2.47E+02	Ci
^{239}Pu	$\mu Ci/cm^3$	8.91E+01	3.81E+01	2.87E+02	9.54E+02	8.27E+02	Ci

Table 2-1. Estimated Inventory for KE Sludge Locations Revised for 1999 Sampling Campaign (4 sheets).

	Units	Canisters Full	Fuel Wash-Coating	Fuel Wash-Internal Sludge	Fuel Wash-Fuel Piece Slurry	**KE Basin Totals**	Units
Nominal Volume of As-settled Sludge	m^3	3.00	0.0925	0.492	0.155	43.8	m^3
As-settled Sludge Density (g settled/cm^3 settled)	g/cm^3	1.87	1.32	2.97	10.5		
Average Water Content	vol%	09	70	70	40		
As-settled Sludge Solid Content (g dry soids/cm^3 as settled sludge)	g/cm^3	1.18	0.618	2.27	10.1		
Nominal Mass of As-settled Sludge	Mg	5.62	0.122	1.46	1.63	62.5	Mg
Nominal Mass of Dry Sludge	Mg	3.54	0.0572	1.12	1.56	32.2	Mg
As-settled Sludge Chemical Composition							
^{240}Pu	µCi/cm^3	4.89E+01	2.24E+01	1.73E+02	5.24E+02	4.62E+02	Ci
^{241}Pu	µCi/cm^3	2.63E+03	7.35E+02	5.92E+03	2.81E+04	2.31E+04	Ci
^{60}Co	µCi/cm^3	9.44E-01	5.80E-01	7.76E-01	1.53E+01	4.50E+01	Ci
^{137}Cs	µCi/cm^3	1.02E+03	8.71E+02	7.81E+03	5.38E+04	2.35E+04	Ci
^{134}Cs	µCi/cm^3	2.84E-01			5.71E+01	1.25E+01	Ci
^{152}Eu	µCi/cm^3				3.84E+00	4.29E+00	Ci
^{154}Eu	µCi/cm^3	1.40E+01	5.54E+00	3.37E+01	4.36E+02	1.84E+02	Ci
^{155}Eu	µCi/cm^3	7.91E+00		1.18E+01	9.21E+01	7.21E+01	Ci
$^{89/90}Sr$	µCi/cm^3	1.82E+03	1.09E+03	8.74E+03	4.08E+04	2.23E+04	Ci
^{99}Tc	µCi/cm^3	1.54E+01			1.19E+01	5.27E+01	Ci
Uranium Composition							
U	kg	2.31E+03	3.49E+01	1.04E+03	1.45E+03	6.80E+03	kg
^{233}U	mass%						
^{234}U	mass%	7.61E-03	6.94E-03	7.26E-03	6.55E-03		
^{235}U	mass%	6.53E-01	6.82E-01	7.64E-01	7.10E-01		
^{236}U	mass%	6.45E-02	8.60E-02	8.59E-02	8.95E-02		
^{238}U	mass%	9.93E+01	9.92E+01	9.91E+01	9.92E+01		

Table 2-2. Estimated Inventory for KW Basin Sludge Locations Revised for 1999 Sampling Campaign (4 sheets).

	Units	Weasel Pit	Main Basin Floor	Discharge Chute	Tech View	North Loadout Pit	Dummy Elevator Pit
Nominal Volume of As-settled Sludge	m^3	0.026	0.822	0.065	0.065	3.64	0.037
As-settled Sludge Density (g settled/cm^3 settled)	g/cm^3	1.54	1.27	1.54	1.25	1.27	1.33
Average Water Content	vol%	58	70	58	71	87	58
As-settled Sludge Solid Content (g dry solids/cm^3 as settled sludge)	g/cm^3	0.962	0.570	0.962	0.541	0.397	0.752
Nominal Mass of As-settled Sludge	Mg	0.0400	1.04	0.100	0.0813	4.61	0.0493
Nominal Mass of Dry Sludge	Mg	0.0250	0.468	0.0622	0.0352	1.45	0.0279
As-settled Sludge Chemical Composition							
Ag_2O	g/cm^3		1.66E-05	-	-	-	-
$Al(OH)_3$	g/cm^3		-	-	-	-	-
Al_2O_3	g/cm^3	6.35E-02	8.51E-02	6.35E-02	3.54E-02	1.42E-02	6.37E-02
BaO	g/cm^3	3.56E-04	1.65E-04	3.56E-04	-	9.68E-05	9.56E-05
CaO	g/cm^3	1.73E-02	5.05E-03	1.73E-02	1.80E-03	4.04E-03	3.67E-03
CdO	g/cm^3	4.83E-05	9.47E-05	4.83E-05	7.09E-05	5.31E-05	6.06E-05
Cr_2O_3	g/cm^3	1.44E-03	5.14E-04	1.44E-03	8.50E-04	1.53E-04	6.42E-04
FeO(OH)	g/cm^3	4.52E-01	2.29E-01	4.52E-01	3.14E-01	3.96E-02	2.79E-01
PbO	g/cm^3	5.50E-04	2.79E-04	5.50E-04	6.29E-04	1.05E-04	8.48E-04
Se	g/cm^3	-	-	-	-	-	-
Umetal	g/cm^3	1.18E-02	1.38E-03	1.18E-02	1.70E-04	8.42E-05	1.81E-04
UO_2	g/cm^3	2.70E-02	3.04E-02	2.70E-02	-	7.71E-03	1.08E-02
U_3O_7	g/cm^3	2.75E-02	3.10E-02	2.75E-02	-	7.87E-03	1.10E-02
$UO_4 \cdot 4H_2O$	g/cm^3	-	-	-	3.90E-02	-	-
UH_3	g/cm^3	-	-	-	-	-	-
Residual solids	g/cm^3	2.61E-01	1.05E-01	2.61E-01	-	8.36E-02	-
CO_2	g/cm^3	7.78E-03	7.92E-03	7.78E-03	-	-	4.63E-03
C	g/cm^3	2.47E-03	1.72E-03	2.47E-03	-	-	2.59E-03
PCB	g/cm^3	1.14E-04	4.80E-05	1.14E-04	9.29E-05	9.41E-05	9.88E-05
OIER	g/cm^3	-	-	-	-	-	-
Zeolite	g/cm^3	-	-	-	-	-	-
Zircolloy 2	g/cm^3	-	-	-	-	-	-
Grafoil	g/cm^3	-	-	-	-	-	-
^{238}Pu	g/cm^3	9.92E-08	1.20E-07	9.92E-08	6.70E-08	3.18E-08	1.71E-08
^{239}Pu	g/cm^3	1.10E-04	1.33E-04	1.10E-04	7.80E-05	3.56E-05	1.77E-05
^{240}Pu	g/cm^3	1.65E-05	1.99E-05	1.65E-05	1.17E-05	5.33E-06	2.66E-06
^{241}Pu	g/cm^3	1.96E-06	2.37E-06	1.96E-06	1.39E-06	6.33E-07	3.16E-07
Balance	g/cm^3	8.92E-02	7.15E-02	8.92E-02	1.49E-01	2.39E-01	3.75E-01
Radionuclide content							
^{241}Am	µCi/cm^3	8.33E+00	1.22E+01	8.33E+00	6.06E+00	2.72E+00	1.39E+00
^{237}Np	µCi/cm^3	1.76E-03	3.67E-03	1.76E-03	-	-	-

Table 2-2. Estimated Inventory for KW Basin Sludge Locations Revised for 1999 Sampling Campaign (4 sheets).

	Units	Weasel Pit	Main Basin Floor	Discharge Chute	Tech View	North Loadout Pit	Dummy Elevator Pit
Nominal Volume of As-settled Sludge	m^3	0.026	0.822	0.065	0.065	3.64	0.037
As-settled Sludge Density (g settled/cm^3 settled)	g/cm^3	1.54	1.27	1.54	1.25	1.27	1.33
Average Water Content	vol%	58	70	58	71	87	58
As-settled Sludge Solid Content (g dry solids/cm^3 as settled sludge)	g/cm^3	0.962	0.570	0.962	0.541	0.397	0.752
Nominal Mass of As-settled Sludge	Mg	0.0400	1.04	0.100	0.0813	4.61	0.0493
Nominal Mass of Dry Sludge	Mg	0.0250	0.468	0.0622	0.0352	1.45	0.0279
As-settled Sludge Chemical Composition							
^{238}Pu	µCi/cm^3	1.70E+00	2.05E+00	1.70E+00	1.15E+00	5.45E-01	2.93E-01
^{239}Pu	µCi/cm^3	6.85E+00	8.26E+00	6.85E+00	4.85E+00	2.21E+00	1.10E+00
^{240}Pu	µCi/cm^3	3.76E+00	4.54E+00	3.76E+00	2.66E+00	1.21E+00	6.06E-01
^{241}Pu	µCi/cm^3	2.02E+02	2.44E+02	2.02E+02	1.43E+02	6.52E+01	3.25E+01
^{60}Co	µCi/cm^3	1.28E+00	9.98E-01	1.28E+00	5.06E-01	4.09E-01	1.26E+00
^{137}Cs	µCi/cm^3	2.48E+02	2.52E+02	2.48E+02	5.43E+01	1.40E+01	2.98E+01
^{134}Cs	µCi/cm^3	1.41E-01	6.03E-02	1.41E-01	-	1.11E-02	-
^{152}Eu	µCi/cm^3	1.33E-01	1.09E-01	1.33E-01	-	-	-
^{154}Eu	µCi/cm^3	1.16E+00	1.92E+00	1.16E+00	5.09E-01	5.64E-01	1.10E-01
^{155}Eu	µCi/cm^3	5.36E-01	9.44E-01	5.36E-01	2.11E-01	3.29E-01	-
$^{89/90}Sr$	µCi/cm^3	1.98E+02	1.88E+02	1.98E+02	4.69E+00	2.49E+00	3.90E+00
^{99}Tc	µCi/cm^3	-	-	-	-	-	-
Uranium Composition							
U	kg	1.54E+00	4.52E+01	3.84E+00	1.63E+00	4.98E+01	7.14E-01
^{233}U	mass%	-	-	-	-	-	-
^{234}U	mass%	7.01E-03	6.55E-03	7.01E-03	-	6.85E-03	0.00E+00
^{235}U	mass%	6.98E-01	7.16E-01	6.98E-01	7.18E-01	7.03E-01	7.10E-01
^{236}U	mass%	8.02E-02	7.62E-02	8.02E-02	9.12E-02	7.71E-02	9.01E-02
^{238}U	mass%	9.92E+01	9.82E+01	9.92E+01	9.92E+01	9.92E+01	9.92E+01

Table 2-2. Estimated Inventory for KW Basin Sludge Locations Revised for 1999 Sampling Campaign (4 sheets).

	Units	Canisters	Fuel Wash-Coating	Fuel Wash-Internal Sludge	Fuel Wash-Fuel Piece Slurry	**KW Basin Totals**	Units
Nominal Volume of As-settled Sludge	m^3	1.01	0.612	0.310	0.0776	6.66	m^3
As-settled Sludge Density (g settled/cm^3 settled)	g/cm^3	2.68	1.32	2.97	10.5		
Average Water Content	vol%	69	70	70	40		
As-settled Sludge Solid Content (g dry solids/cm^3 as settled sludge)	g/cm^3	1.99	0.618	2.27	10.1		
Nominal Mass of As-settled Sludge	Mg	2.71	0.807	0.921	0.813	11.17	Mg
Nominal Mass of Dry Sludge	Mg	2.01	0.378	0.704	0.782	5.94	Mg
As-settled Sludge Chemical Composition							
Ag_2O	g/cm^3	--	--	--	--	1.36E-02	kg
$Al(OH)_3$	g/cm^3	1.18E-01	3.47E-01	1.27E-01	-	3.70E+02	kg
Ai_2O_3	g/cm^3	-	-	-	-	1.32E+02	kg
BaO	g/cm^3	5.65E-04	1.41E-04	3.04E-04	-	1.28E+00	kg
CaO	g/cm^3	-	1.74E-03	-	-	2.18E+01	kg
CdO	g/cm^3	-	-	-	-	2.82E-01	kg
Cr_2O_3	g/cm^3	9.35E-04	4.84E-04	6.63E-04	-	2.64E+00	kg
FeO(OH)	g/cm^3	2.09E-01	1.95E-01	3.97E-03	-	7.36E+02	kg
PbO	g/cm^3	-	-	-	-	7.34E-01	kg
Se	g/cm^3	-	-	-	-	-	kg
Umetal	g/cm^3	6.73E-02	-	-	9.37E+00	7.97E+02	kg
UO_2	g/cm^3	6.74E-01	-	2.13E+00	-	1.40E+03	kg
U_3O_7	g/cm^3	6.87E-01	-	-	-	7.51E+02	kg
$UO_4 \cdot 4H_2O$	g/cm^3	-	1.71E-02	-	-	1.30E+01	kg
UH_3	g/cm^3	6.81E-02	-	2.11E-01	-	1.34E+02	kg
Residual solids	g/cm^3	-	-	-	-	4.14E+02	kg
CO_2	g/cm^3	2.91E-03	-	-	-	1.03E+01	kg
C	g/cm^3	2.93E-03	-	-	-	4.70E+00	kg
PCB	g/cm^3	3.09E-06				4.05E-01	kg
OIER	g/cm^3	-				-	kg
Zeolite	g/cm^3	-				-	kg
Zircolloy 2	g/cm^3	-			6.60E-01	5.12E+01	kg
Grafoil	g/cm^3	5.52E-02				5.58E+01	kg
^{238}Pu	g/cm^3	3.23E-06	2.54E-08	2.74E-06	2.94E-05	6.63E-03	kg
^{239}Pu	g/cm^3	3.05E-03	2.53E-05	3.90E-03	1.60E-02	5.80E+00	kg
^{240}Pu	g/cm^3	4.55E-04	3.74E-06	5.60E-04	2.40E-03	8.60E-01	kg
^{241}Pu	g/cm^3	5.94E-05	3.46E-07	3.83E-05	3.13E-04	1.01E-01	kg
Balance	g/cm^3	1.02E-01	5.65E-02	-2.05E-01	3.51E-02	1.04E+03	kg
Radionuclide content							
^{241}Am	$\mu Ci/cm^3$	2.62E+02	2.71E+00	3.36E+02	1.67E+03	5.21E+02	Ci
^{237}Np	$\mu Ci/cm^3$	2.86E-02	-	-	2.67E-01	5.28E-02	Ci
^{238}Pu	$\mu Ci/cm^3$	5.52E+01	4.35E-01	4.69E+01	5.04E+02	1.14E+02	Ci

Table 2-2. Estimated Inventory for KW Basin Sludge Locations Revised for 1999 Sampling Campaign (4 sheets).

	Units	Canisters	Fuel Wash-Coating	Fuel Wash-Internal Sludge	Fuel Wash-Fuel Piece Slurry	**KW Basin Totals**	Units
Nominal Volume of As-settled Sludge	m^3	1.01	0.612	0.310	0.0776	6.66	m^3
As-settled Sludge Density (g settled/cm^3 settled)	g/cm^3	2.68	1.32	2.97	10.5		
Average Water Content	vol%	69	70	70	40		
As-settled Sludge Solid Content (g dry solids/cm^3 as settled sludge)	g/cm^3	1.99	0.618	2.27	10.1		
Nominal Mass of As-settled Sludge	Mg	2.71	0.807	0.921	0.813	11.17	Mg
Nominal Mass of Dry Sludge	Mg	2.01	0.378	0.704	0.782	5.94	Mg
As-settled Sludge Chemical Composition							
^{239}Pu	µCi/cm^3	1.90E+02	1.57E+00	2.43E+02	9.97E+02	3.61E+02	Ci
^{240}Pu	µCi/cm^3	1.04E+02	8.53E-01	1.28E+02	5.46E+02	1.96E+02	Ci
^{241}Pu	µCi/cm^3	6.12E+03	3.56E+01	3.95E+03	3.22E+04	1.04E+04	Ci
^{60}Co	µCi/cm^3	2.01E+01	1.39E+01	4.56E-01	2.07E+01	3.31E+01	Ci
^{137}Cs	µCi/cm^3	3.78E+03	3.57E+01	5.01E+03	6.56E+04	1.08E+04	Ci
^{134}Cs	µCi/cm^3	2.85E+00	-	6.80E-01	8.85E+01	1.01E+01	Ci
^{152}Eu	µCi/cm^3	-	-	-	4.71E+00	4.67E-01	Ci
^{154}Eu	µCi/cm^3	4.97E+01	4.53E-01	2.74E+01	5.37E+02	1.04E+02	Ci
^{155}Eu	µCi/cm^3	2.23E+01	2.45E-01	8.19E+00	1.07E+02	3.55E+01	Ci
$^{89/90}Sr$	µCi/cm^3	6.17E+03	5.74E+01	4.80E+03	5.11E+04	1.19E+04	Ci
^{99}Tc	µCi/cm^3	2.11E+00	-	-	1.41E+01	3.22E+00	Ci
Uranium Composition							
U	kg	1.34E+03	6.67E+00	6.46E+02	7.26E+02	2.82E+03	kg
^{233}U	mass%	-	-	-	-		
^{234}U	mass%	7.70E-03	9.01E-03	5.94E-03	6.89E-03		
^{235}U	mass%	8.13E-01	9.09E-01	6.71E-01	7.80E-01		
^{236}U	mass%	9.49E-02	9.26E-02	8.87E-02	9.95E-02		
^{238}U	mass%	9.91E+01	9.90E+01	9.92E+01	9.91E+01		

Table 2-3. Uranium Metal Fraction in Settled Sludge.

K Basin sludge source	Design basis value[1]	Safety basis values[1]
KE Floor and Pit Sludge[2]	0.004 g/cm^3 (0.26 wt%)	0.023 g/ cm^3 (1.5 wt%)
KE Canister Sludge	0.040 g/cm^3 (2.1 wt%)	0.125 g/cm^3 (5 wt%)
KE Basin NLOP Sludge	0.000080 g/cm^3 (0.0057 wt%)	0.00051 g/cm^3 (0.034 wt%)
KW Floor and Pit Sludge		
Near fuel handling/processing area	0.063 g/cm^3 (2.1 wt%)	0.200 g/cm^3 (5 wt%)
Other floor and pit areas[2]	0.004 g/cm^3 (0.26 wt%)	0.023 g/cm^3 (1.5 wt%)
KW Basin NLOP Sludge	0.004 g/cm^3 (0.26)	0.023 g/cm^3 (1.5 wt%)
KW Canister Sludge	0.063 g/cm^3 (2.1 wt%)	0.200 g/cm^3 (5 wt%)
Fuel Piece and Wash Sludge	9.40 g/cm^3 (89.5 wt%)	9.40 g/cm^3 (89.5 wt%0

[1] Values provided are conservative design values accounting for uncertainties and assuming consolidation of various sludge sub-streams versus the more general nominal values provided for all sub-streams in Tables 2-1 and 2-2.
[2] Excluding NLOP sludge.

Table 2-4. Thermal Conductivity and Yield Strength of As Settled Sludge.

K Basin sludge source	Design and safety basis values	
	Thermal conductivity	Range of yield strength values in sludge
KE Floor and Pit Sludge KE Canister Sludge KE Basin NLOP Sludge	0.70 W/mK	1 to 8200 Pa
KW Floor and Pit Sludge Near fuel handling/processing area Other floor and pit areas	 0.70 W/mK 0.70 W/mK	 20 to 40 Pa 1 to 8200 Pa
KW Basin NLOP Sludge	0.70 W/mK	1 to 8200 Pa
KW Canister Sludge	0.70 W/mK	20 to 40 Pa
Fuel Piece and Wash Sludge	3.9 W/mK	NA
Water[1]	0.6 W/mK	NA
Silica[1] (i.e., sand)	1.3 W/mK	NA
Uranium Dioxide[1] (UO_{2+x})	1.8 W/mK	NA
Uranium Metal[1] (U)	28 W/mK	NA

[1] Provided for reference
Pa = Pascals.
W/mK = Watts/meter-Kelvin.

3.0 DEFINITION OF WASTE STREAMS REQUIRING DISPOSITION

This section identifies the sludge and debris waste streams that will require disposition within the scope of this Addendum.

3.1 SLUDGE WASTE STREAMS

The four primary sludge waste streams generated from basin cleanout that will require disposition are identified in Figure 3-1 and include the following:

- KE Basin NLOP
- KE/KW floor and pits (excluding KE Basin NLOP)
- Knockout pots (KOP) (including canister sludge)
- KW Integrated Water Treatment System (IWTS) settling tank (including canister sludge).

K Basin sludge streams are divided for final disposition into two general categories. One category is the bulk volume of sludge (KE and KW floor, pit, canisters, and settler sludge). This sludge is to be treated for final disposal at an off-Hanford Site disposal unit as radioactive waste and is within the scope of this Addendum. A portion of this sludge could be treated to meet ERDF WAC if it is determined during remedial design to be practicable and cost effective. The other category is selected material from the KW Basin IWTS KOPs and strainers from the KE Basin sludge and water system (generally greater than ¼ inch in size). This material can be disposed as SNF at Yucca Mountain. Because the ROD-selected SNF remedy has not changed, material designated as SNF is within the scope of the K Basins CERCLA action but outside the scope of this Addendum. During the removal of sludge from the KE Basin, it is likely that SNF or scrap SNF will be found commingled with sludge. Scrap SNF will be collected in strainers and managed separately from the sludge using methods currently in place for SNF.

K Basins sludge is a multiphasic PCB remediation waste due to the presence of PCBs in sludge at concentrations regulated under TSCA. Treated sludge that designates as CH TRU waste is planned to be shipped to an off-Hanford Site disposal unit soon after treatment. Treated sludge designating as RH TRU waste currently is planned to be containerized and the containers transported to CWC for interim storage until disposal at an off-Hanford Site chemical waste landfill that can accept radioactive PCB remediation waste. CWC currently can accept this RH TRU waste and PCB remediation waste for storage. Consequently, further treatment of PCB remediation waste for off-Hanford Site disposal or for storage at CWC is not required. Any treatment that removes PCBs or reduces PCB concentrations in sludge is incidental to treatment required to meet other requirements.

Due to differences in characteristics of the KE Basin NLOP sludge, constituting approximately 12% of K Basins sludge, this sludge could be removed first and transported to the T Plant Complex in the 200 Area for treatment. Although solidification treatment by grouting is planned, treatment potentially could use a hybrid of the treatments previously evaluated to meet WAC for disposal at an off-Hanford Site unit as radioactive waste. However, treated sludge could require storage pending offsite disposal. Early treatment of this sludge fraction would reduce the overall quantity of sludge requiring future treatment and could provide treatability information applicable to later sludge treatment. It would also reduce risks of further releases from the basins and expedite the overall sludge treatment schedule.

3.2 DEBRIS WASTE STREAMS

Basin debris includes fuel canisters, old equipment and piping, hand tools, canister storage racks, basin construction materials, equipment used for basin cleanout, water treatment system equipment, and equipment and structural materials generated during basin deactivation. Most debris that was located above the basin water line during basin operations is expected to be low-level radioactive waste.

Some of the debris that was located below the basin water line during basin operations would be left in the basins and encapsulated in grout to become an integral part of the basin structure. This debris may undergo size reduction, washing, or other activities, such as orienting or sectioning to address removal of void spaces before being grouted and disposed at ERDF as LLW, along with the basin structures. ERDF can accept non-liquid PCB remediation waste. Any treatment that would remove, reduce, or otherwise mitigate PCB concentrations in or on debris is incidental to treatment required to meet other requirements.

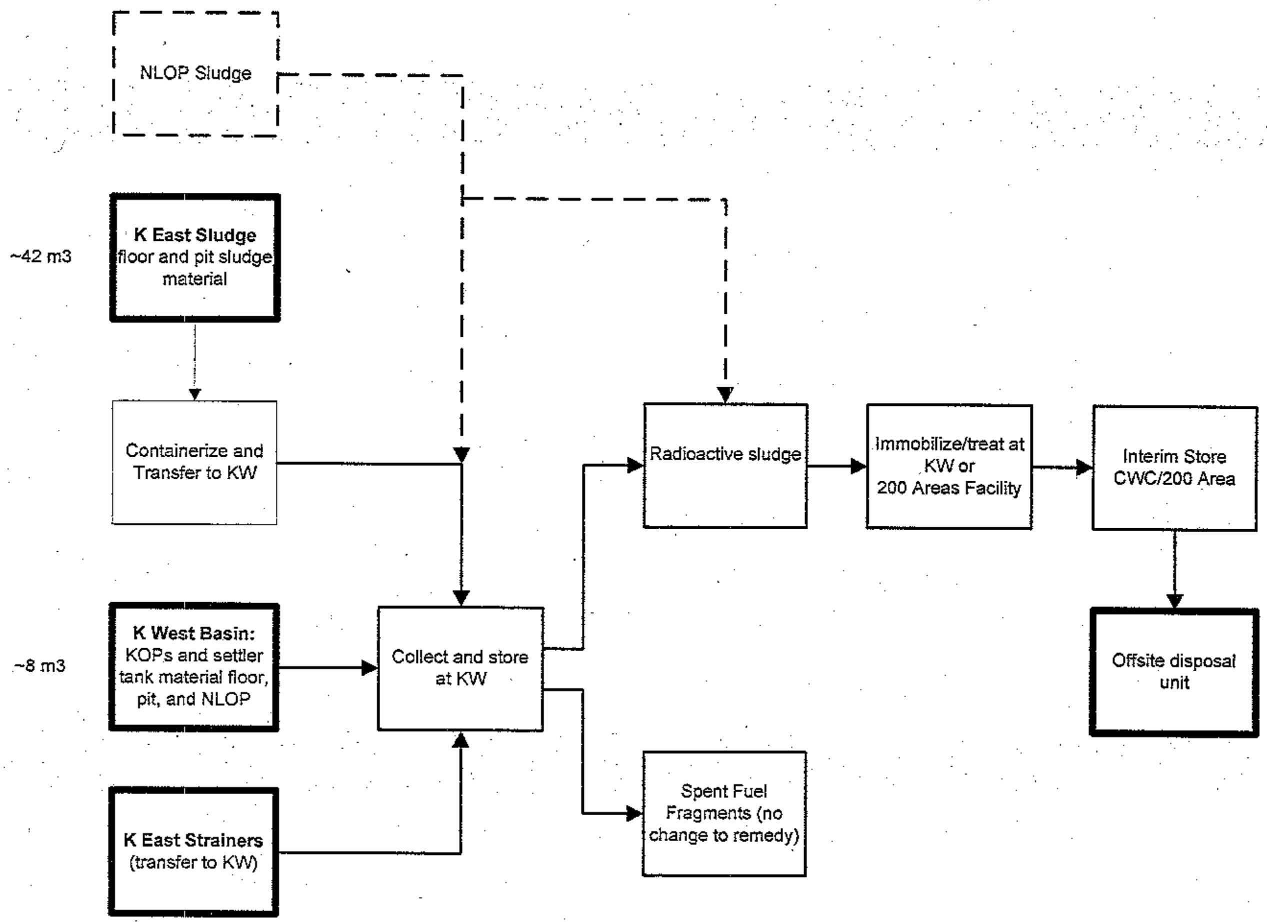

Figure 3-1. Primary K Basin Sludge Streams Requiring Treatment and Disposal.

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4.0 DESCRIPTION OF NEW REMEDY ALTERNATIVES

This section identifies new remedy alternatives for K Basins sludge and debris.

4.1 NEW SLUDGE REMEDY (ALTERNATIVE 2)

This section identifies new Sludge Alternative 2 and primary sludge treatment needs for disposal.

4.1.1 Sludge Alternative 2 (Remove and Treat)

New Sludge Alternative 2 integrates sludge removal and treatment so that treatment occurs earlier than under the previous remedy (Alternative 1) that placed untreated sludge into interim storage. The new sludge remedy would meet the ARARs and TBCs identified in Table A-1 and ARARs in the initial 1999 Interim Action ROD. New Sludge Alternative 2 proposes sludge treatment and packaging at 100 K Area or another EPA-approved 200 Areas facility soon after removal to meet WAC for disposal at an off-Hanford Site unit as radioactive PCB remediation waste. The new remedy alternative for sludge could use a hybrid combination of the treatment technologies (physical, chemical, thermal, and solidification) evaluated in the 1999 FFS. Since 1999, no significant changes to the accepted technologies have been identified so treatment technology information and evaluations remain valid and will not be revisited in this Addendum. The K Basins sludge streams and an appropriate treatment technology are shown in Table 4-1. The details of sludge treatment will be contained in a modification of the Remedial Design Report/Remedial Action Work Plan (RDR/RAWP) for this action. The most likely initial sludge for treatment is the 105-K East NLOP sludge which may be managed as a treatability study. KE NLOP sludge would be removed from the KE Basin and transported to T Plant Complex, an operating 200 West Area treatment facility, for treatment by solidification. As necessary, capacity for short-term, contingency storage of treated and/or untreated sludge ('lag storage') would be available at a 200 Areas storage facility if treatment or disposal delays occur. This interim remedial action will be considered complete when sludge has been treated and packaged into a form suitable for offsite disposal and shipped off Hanford for disposal. The DOE will seek to ship all sludge by 12/31/2012 (EPA and DOE 2004). Treatment soon after removal significantly accelerates the sludge stabilization and disposal and eliminates risk and cost associated with interim storage of untreated waste.

4.1.2 Principal Sludge Treatment Needs

Sludge will require treatment to the extent necessary to meet WAC for disposal at an off-Hanford Site disposal unit as radioactive PCB remediation waste. This section addresses requirements for treated sludge designated as TRU waste. Treatment, in this case must address WAC for reactive metal, free liquids, hydrogen gas, and radiological dose (for CH waste). The WAC for RH TRU waste currently is in draft form. Two predominant waste treatment criteria must be achieved to meet WAC and transportation requirements: the waste can contain no drainable liquids and must not generate hydrogen in excess of stringent specified limits. Secondary considerations include plutonium limits [fissile gram equivalents (FGEs)] and thermal loading per shipment/shipping container. K Basins sludge is a multiphasic PCB remediation waste. A TSCA risk-based disposal approval for PCB treatment requested in the 1999 FFS, Appendix C, has been granted and PCB considerations are no longer a significant portion of treatment planning. This section describes the aspects of the WAC that the sludge treatment and packaging system must meet.

4.1.2.1 No Free Liquids

The Draft RH WAC requires that waste forms for disposal contain no free liquids. The baseline plan for sludge preparation for disposal calls for immobilizing waste in grout to bind up free liquid. Other means of elimination or binding free liquids are under consideration and could be employed to meet disposal criteria.

4.1.2.2 Hydrogen Gas Generation

The current CH WAC and transportation criteria contain provisions for only recognizing hydrogen generation from radiolysis. K Basins sludge, as it presently exists, contains uranium metal fines from fuel corrosion subject to further corrosion in water, which liberates hydrogen as a by-product. To meet rigid criteria for transportation, the bulk of the metal fines have to be removed or passivated to suppress the mechanism for hydrogen generation (pyrophoric characteristics). One means of mitigating this hazard is to oxidize those fines before solidification. Radiolysis of bound water is expected to be the principal source of hydrogen generation and is controlled by limiting the waste loading in each package and each shipment.

4.1.2.3 Plutonium Limits and Dose Considerations

The bulk of the KE and KW sludge is sufficiently rich in fuel corrosion products that producing a CH radioactive waste form is highly impractical. The dilution factor required to achieve a waste form with a contact dose of 200 millirem or less produces tens of thousands of radioactive waste packages requiring an excessive number of transportation shipments. Package estimates for disposal as RH radioactive waste are in the low thousands.

The KE Basin NLOP waste stream is dealt with differently than the balance of the K Basin sludge streams. The most likely initial sludge for treatment is the 105-K East NLOP sludge which may be managed as a treatability study. The sludge consists of material from sand filter back washing and is determined to be low enough in fuel corrosion products that the sludge could be solidified and disposed as CH TRU waste. The sludge is treated separately from the rest of the basin sludge by loading the sludge out and transporting the sludge to T Plant Complex, an operating 200 West Area treatment facility, for treatment for disposal by solidification.

4.2 NEW DEBRIS REMEDY (ALTERNATIVE 2)

Under new Debris Alternative 2 (Leave Some Debris in Basins and Grout), not all debris would be removed from the basins. Superstructures covering the basins, fuel transfer structures, and the belowgrade basins would be removed and the debris disposed at ERDF as Low-Level Waste, as selected in the 1999 ROD. However, after sludge removal, debris that was located below-water (racks, steel canisters, processing equipment) would be left in the basins. This debris would be size-reduced, washed, and have void spaces removed as necessary to facilitate waste acceptance at ERDF and cement-based grout would be poured into the basins. Before grouting, debris would be oriented or sectioned so that void spaces are filled with grout for disposal at ERDF. The grouting would be integrated with basin deactivation activities and would serve two purposes. The primary purpose would be to provide radiological shielding from contaminated basin floor surfaces. Secondarily, the grout would serve to encapsulate debris remaining in the basins, thereby eliminating the risk from the debris and the need to immediately remove the debris. The encapsulated debris would be mechanically removed simultaneously with the basin structures in an expedited manner for disposal at ERDF under the 100 Areas Remaining Sites ROD, the schedule for which has been accelerated in accordance with M-34 Tri-Party Agreement Milestone changes (EPA and DOE 2004). Leaving the encapsulated debris would minimize debris handling, thereby reducing costs, radiological exposure, and cleanup time. The new debris remedy would meet the ARARs and TBCs identified in Table A-1.

4.3 ASSOCIATED BASIN DEACTIVATION ACTIVITIES

Under Debris Alternative 2, much of the debris in the spent fuel storage basins that had been located below the basin water line (e.g., racks, miscellaneous debris, and equipment) would remain in the basin to be encapsulated in cement-based grout. The major elements of the basin deactivation are described in the following sections.

Demolition and removal of the basin structures will be conducted under the 100 Areas Remaining Sites ROD, outside the scope of the K Basin interim remedial action. Information regarding demolition and removal of the basins is provided for reader information only.

4.3.1 Decontamination of the K-East and K-West Basins

Decontamination of the KE Basin and KW Basin activities will commence upon completion of sludge removal operations. This will include decontamination (hydrolasing) of portions of the basin walls and floors necessary to remove concrete into which cesium-137 has migrated causing a radiation exposure hazard after water is removed from the basin.

4.3.1.1 Utility Isolation/Services

A dedicated electrical distribution system will be installed for all power needs. Selected basin systems (e.g., continuous air monitoring system, dewatering) will be powered from this distribution system. Construction power will be routed from this distribution as well. Other utility services will be provided, including: potable water, service water, fire protection, emergency services, sanitary services, waste disposal and miscellaneous services (telephones, computers, etc.).

4.3.1.2 Material and Equipment Disposition

Equipment not needed for decontamination and demolition will be removed from the building and superstructures. Most material and equipment will be packaged for disposal in ERDF as Low-Level Waste. Those items that cannot be decontaminated or treated to meet ERDF WAC will be shipped to the CWC for storage pending future treatment and disposal. Nonradioactive materials and equipment will be managed in accordance with existing policies governing the excessing or disposal of material and equipment.

4.3.1.3 Cleaning of Basin Surfaces

The interior basin walls are contaminated and will be cleaned above and slightly below the planned grout level using either hydrolasing or high-pressure washing techniques.

The hydrolasing will be performed under water to minimize worker exposure and to eliminate the airborne contamination hazard. 'Cut lines' (the lines along which where the grouted basins will be cut into sections for removal and disposal) of both basins will also be cleaned by hydrolasing to minimize radiation levels and suspension of airborne contamination from the cutting of concrete that will occur after water is removed from the basins. Concrete residues generated during basin surface cleaning will be grouted in place or managed separately according to characteristics.

4.3.1.4 Basin Grouting and Water Removal

The dewatering will be accomplished using onsite water tank trucks. The water will be transferred via the water tank trucks to the ETF. It is anticipated that about 2.6 to 3.0 million gallons (9.8 to 11.4 million liters) of water will be taken to the ETF (approximately equal volume from each basin).

The grout would be installed underwater using grout lances (i.e., pipes positioned vertically into the basin pools that would allow introduction of grout directly to the basins' floor). It is anticipated that 6 feet (1.8 meters) of grout would be necessary in KE Basin. Grout would be installed in KE Basin to the level required to cover debris remaining in the basin. The grout would be installed around the racks and debris, encasing these into the grout block. The four pits and the discharge chute would be grouted full-depth.

Lightweight grout would be used to reduce the final lift load. The lightweight grout would provide mass to contain the embedded objects, provide the proper shielding, and result in the lowest possible weight.

The specific grout density and weight will be confirmed in 2005, based on the results of the hydrolasing demonstration performed in 2004. A combination of hydrolasing and grouting would be applied to achieve the optimum result.

If wall shielding is required, the layer of grout would first be poured in the bottom of the basins. A welded wire fabric layer would turn up the walls from the slab, providing attachment between the floor and walls. Outside forms would be attached to a new steel framework around the basin walls. A currently estimated two-foot thick layer of grout would be poured around the existing walls, providing shielding from contamination. The grout at the walls can be poured to a maximum of 16 feet (4.9 meters) above the existing floor of the basins, if necessary.

During the superstructure demolition activity, appropriate measures would be taken to protect the grout from potential damage (i.e., plywood cover, sand, etc.). If required, additional localized shielding for purposes of radiological dose reductions can be applied at the time the basin slabs are cut and lifted for transport.

4.3.1.5 Reactor Building Isolation

The reactor building discharge chute will be isolated prior to de-watering of the K Basins. The discharge chutes separating the reactors from the basins will be grouted to provide isolation of the reactors. The grout pour will seal off the opening with the contaminated reactor facility presently isolated/sealed with a water barrier. Following basin demolition work, any open penetrations to the reactor building will be sealed.

4.3.2 Superstructure Demolition

Following the completion of the hydrolasing, grouting, and dewatering processes, the remaining basin radiation sources would be shielded sufficiently with grout or source term reduced to allow the removal of the superstructures covering the basins. The interior basin structures would be de-contaminated or have fixatives applied as determined necessary following the de-watering of the basins. Additionally, a comprehensive radiological survey will be completed following the de-contamination and fixative activities. The superstructures may be demolished using mechanical methods used successfully in other nuclear facility demolitions. Scissor-lift scaffolds and 'cherry pickers' will be used to aid in the safe removal of the exterior roof panels. The steel structures will be removed and size reduced for transport in the disposal boxes to ERDF. Wastes, such as the cement-asbestos board siding and roofing materials and interior wall contamination, will be managed per the Occupational Safety and Health Administration asbestos regulations, sized, and treated as required to meet ERDF WAC.

4.3.3 Basin Removal

This phase includes the excavation and the removal of the basins and all below-grade structures, including the basin leachate collection systems piping, surrounding soil, and the asphalt barrier. Removal of these materials will be in accordance with the schedule and methods of the 100 Areas Remaining Sites ROD and Tri-Party Agreement Milestones M-34-32 and M-34-00A, outside the scope of this Addendum.

The operating floor slabs would be removed using hydraulic excavators with hammer attachments (hoe rams). The slab areas around the pits and basins would be cut using conventional concrete-cutting equipment. Once the slabs are removed, underground tanks and piping would be excavated, size reduced, decontaminated or grouted, and removed. It is assumed that 15 percent of the excavated soil will be contaminated and require disposal at ERDF as low-level waste. The remaining soil will be stockpiled for use later as backfill material.

The grouted basins and pits would be cut into sections, lifted onto heavy transport trailers, and transported to ERDF for disposal. An experienced specialty contractor would cut each basin into seven sections using diamond wire sawing. Each of the seven sections can be further cut into an additional three pieces if needed. Wastes generated as part of the cutting operations would be collected and packaged for disposal.

Lifting beams have been evaluated with a safety factor of 3, as detailed in the FH engineering report SNF–16984, Rev. 0, *K-Basin Removal Evaluation, June 2003*, for lifting the basin sections from their existing location to the transport trailer. The base slab loads include the weight of the debris, grout, attached gravel, and slab concrete. The basin slab rests on a 2-inch (5.1-centimeter) gravel bed, which is assumed to be embedded into the concrete and part of the lifting load.

A variety of scenarios have been examined in SNF-16984, Rev. 0 to determine the integrity of the concrete sections during the lifts. Bending deflection was considered as it relates to grout cracking and adhesion of the grout to old concrete interfaces. SNF-16984, Rev. 0 demonstrates that the sections formed by cutting the K Basin into large sections can be lifted safely with the grout remaining intact.

A large mobile crane would be used to lift the sections from their existing location to the transport trailer. The same crane that would be used at KE Basin would be 'walked' to KW Basin for a similar operation.

The transportation trailers would be weighed following the loading activities and fixative/packaging would be applied as needed based on survey results. Radiological surveys would be performed on the trailer and waste before shipment and upon receipt at ERDF. The cut sections would be transported to ERDF for disposal as low-level waste using a heavy transport trailer, which is especially designed to carry large loads and to distribute the load to avoid damage to existing roads. A physical inspection of the transport route has identified need for minor upgrades and utility adjustments (power lines). Minor upgrades to the transportation roadway, particularly at corners and at the pipeline overpass at the intersection of Route 3 and Route 3N, would be made to accommodate transportation of these sections. The sections would be lifted off the trailers at ERDF, using two large cranes, or other offloading devices, as needed.

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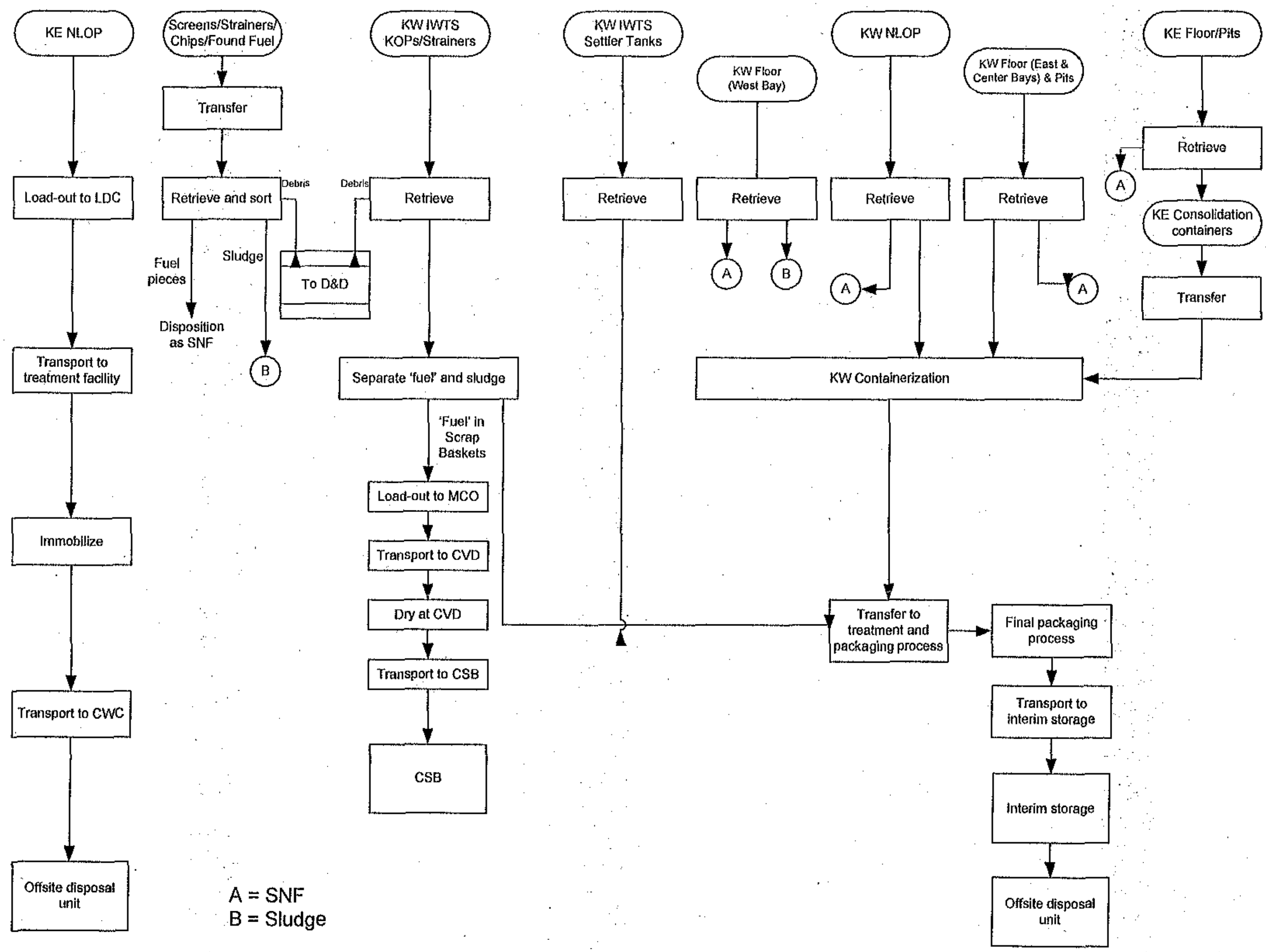

Figure 4-1. K Basin Sludge Process Flow Diagram.

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Table 4-1. K Basin Sludge Treatment Options (2 sheets).

Sludge Stream | V	Chemical	Physical (pretreatment function, if necessary)	Thermal	Solidification
Screens, Strainers, Chips, Found Fuel	Oxidize/passivate 'non-fuel': • Acid dissolution and neutralization • Peroxide oxidation to passivate the U • Hot water oxidation	Size classify material for subsequent thermal and/or chemical processing. Note: 'SNF' pieces to be treated via cold vacuum drying Segregate the sludge from the SNF. Note: Fuel material treated via CVD processing.	Thermal treatment options include: • Cold vacuum dry suitable sized U • Vitrification • Calcination • Pyrolization	Solidifying agents as needed such as Portland cement plus additives (e.g., fly ash, clays, etc.) to enhance properties of the final waste form. Sludge fraction processed and packaged to meet for disposal at an offs-Hanford Site unit as radioactive waste..
IWTS KOP and strainer Material	Passivation/chemical treatment of U metal: • Acid dissolution and neutralization • Peroxide oxidation to passivate the U° • Hot water oxidation	Size classify material for subsequent thermal and/or chemical processing. Segregate the sludge from the SNF. Note: Fuel material treated via CVD processing. Non-' SNF ' to chemical treatment.	Thermal treatment options include: • Cold vacuum dry U 'fuel' material from IWTS KOPs suitable for processing. • Vitrification • Calcination • Pyrolization	Solidifying agents as needed such as Portland cement plus additives (e.g., fly ash, clays, etc.) to enhance properties of the final waste form. Sludge fraction processed and packaged to meet for disposal at an offs-Hanford Site unit as radioactive waste.
KW Settler Tanks (to include sorting table 'near' floor sludge)	Passivation/chemical treatment of U metal. Options include: • Acid dissolution and neutralization • Peroxide oxidation to passivate the U° • Hot water oxidation	Physically separate sludge from U Segregate the sludge from the bulk settler tank sludge.	Thermal treatment options include: • Vitrification • Calcination • Pyrolization	Solidifying agents as needed such as Portland cement plus additives (e.g., fly ash, clays, etc.) to enhance properties of the final waste form. Sludge fraction processed and packaged to meet for disposal at an off-Hanford Site unit as radioactive waste.

Table 4-1. K Basin Sludge Treatment Options (2 sheets).

Sludge Stream | V	Chemical	Physical (pretreatment function, if necessary)	Thermal	Solidification
KE Floor Sludge KW Floor Sludge (w/o West bay) KW Pits KW NLOP	Chemical treatment options: • Acid dissolution and neutralization • Peroxide oxidation to passivate the U • Hot water oxidation	Physically separate U from the bulk sludge to increase sludge loading in the final solidified waste form (i.e., reduce net hydrogen generation from U corrosion) Segregate the sludge from the bulk settler tank sludge. Note: sludge transferred to solidification and packaging process	Thermal treatment options include: • Vitrification • Calcination • Pyrolization	Solidifying agents as needed such as Portland cement plus additives (e.g., fly ash, clays, etc.) to enhance properties of the final waste form. Sludge fraction processed and packaged to meet for disposal at an off-Hanford Site unit as radioactive waste.

5.0 DETAILED ANALYSIS OF NEW REMEDIES

This section analyzes the new sludge and debris remedy alternatives described in Section 4.0 against the nine CERCLA remedy evaluation criteria. The previous ROD-accepted remedy alternatives (Sludge Alternative 1 and Debris Alternative 1) were analyzed against the nine CERCLA criteria in the 1999 FFS and are not re-evaluated. This analysis provides information used in Section 6.0 to compare the new remedy alternatives to the prior ROD-selected remedy.

5.1 EXPLANATION OF CERCLA EVALUATION CRITERIA

The nine CERCLA evaluation criteria are as follows:

1. *Overall Protection of Human Health and the Environment* is the primary objective of the remedial action and addresses whether a remedial action provides adequate overall protection of human health and the environment. This criterion must be met for a remedial alternative to be eligible for consideration.

2. *Compliance with Applicable or Relevant and Appropriate Requirements* addresses whether a remedial action would meet all of the applicable or relevant and appropriate requirements and other federal and Washington Stage environmental statutes, or provides grounds for invoking a waiver of the requirements. This criterion must be met for a remedial alternative to be eligible for consideration.

3. *Long-Term Effectiveness and Permanence* refers to the magnitude of residual risk and the ability of a remedial action to maintain long-term reliable protection of human health and the environment after remedial goals have been met.

4. *Reduction of Toxicity, Mobility, or Volume Through Treatment* refers to an evaluation of the anticipated performance of the treatment technologies that could be employed in a remedy. Reduction of toxicity, mobility, and/or volume contributes toward overall protectiveness.

5. *Short-Term Effectiveness* refers to evaluation of the speed with which the remedy achieves protection. This also refers to any potential adverse effects on human health and the environment during the construction and implementation phases of a remedial action.

6. *Implementability* refers to the technical and administrative feasibility of a remedial action, including the availability of materials and services needed to implement the selected solution.

7. *Cost* refers to an evaluation of the capital, operation and maintenance, and monitoring costs for each alternative.

8. *Washington State Acceptance* indicates whether the Washington State concurs with, opposes, or has no comment on the preferred interim alternative based on review of the focused feasibility study and the proposed plan.

9. *Community Acceptance* assesses the general public response to the Proposed Plan, following a review of the public comments received during the public comment period and open community meetings. The remedial action is selected only after consideration of this criterion.

5.2 DETAILED ANALYSIS OF SLUDGE REMEDY ALTERNATIVE 2

This section provides detailed analysis of Sludge Alternative 2 (Remove and Treat) against the nine CERCLA criteria. Sludge Alternative 1 (No change from ROD) and new Sludge Alternative 2 both remove all sludge but differ with regard to sludge disposition after removal.

5.2.1 Overall Protection of Human Health and the Environment

Alternative 2 would achieve overall protection of human health and the environment by removing sludge from the K Basins and treating and packaging the sludge for disposal soon after removal. Sludge shall be treated and packaged in a manner that provides for disposal that is protective of human health and the environment as described in 40 CFR 191, *Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Waste.* Sludge removal would eliminate the risk of release of sludge contaminants from the basins upon completion of the remedial action. Sludge treatment at the 100 K Area or a 200 Area facility as required to meet WAC for disposal at an off-Hanford Site unit as radioactive PCB remediation waste will achieve a more stable and less mobile waste form. This would reduce risk and hazards associated interim storage of untreated sludge under Alternative 1and would enable earlier sludge disposal. Sludge treatment would result in a temporary increase in worker exposure and a potential temporary increase in public exposure. However, in the long-term, expedited permanent treatment would greatly reduce potential worker and public exposure and potential adverse environmental impacts. Although treatment of some sludge could occur at the 100-K Areas that are close to the Columbia River, there is a low probability of accidents associated with this treatment. Treatment activities would be closely monitored and potential accident scenarios would be mitigated by engineered and administrative controls.

5.2.2 Compliance With ARARs

ARARs are identified in Appendix A for revisions to the remedy. ARARs established in the 1999 ROD would continue as ARARs in the amended ROD. Sludge Alternative 2 is designed to comply with all ARARs and to-be-considered (TBC) criteria. Key ARARs include standards for liquid effluent discharge, radioactive waste management, PCB waste management, air emissions, waste transport, and radiation protection. The ARARs and TBC criteria for sludge designation as a TRU waste are provided in Appendix A. Sludge treatment and packaging would meet WAC for disposal at an off-Hanford Site disposal unit as radioactive PCB remediation waste. However, if WIPP is the selected off-Hanford Site disposal unit, it cannot currently accept treated sludge that designates as RH TRU waste (until draft WAC for RH TRU waste is finalized). No waivers from ARARs are necessary to implement this alternative.

Summary. Sludge Treatment Alternative 2 meets all ARARs without waivers and with no significant issues pending issuance of the RH TRU WAC for sludge that designates as RH TRU waste.

5.2.3 Long-Term Effectiveness and Permanence

Sludge Alternative 2 would provide a significant degree of long-term effectiveness by removing sludge from the basins and implementing treatment that permanently achieves a stable, less mobile waste form ready for disposal. If disposal delays occur, the treated sludge could be transferred to an approved, onsite facility designed to provide safe interim storage pending disposal. The risk of hazardous substance releases from the basins is permanently reduced by removing all sludge from the basins. Sludge removal and treatment do not rely on long-term engineered controls at K Basins and allow earlier termination of site engineering and administrative controls.

Summary. Under Alternative 2, the majority of K Basins hazardous substances would be removed from the basins for treatment and disposal. This would greatly reduce the risk of further releases to the environment at the basins while also eliminating the risks associated with the handling and storage of untreated sludge under Alternative 1.

5.2.4 Reduction in Toxicity, Mobility, and Volume Through Treatment

Sludge Alternative 2 reduces the mobility of hazardous substances in sludge and its intrinsic hazards by treatment. Depending on the treatment technology implemented, this Alternative could also reduce toxicity of hazardous substances. This alternative satisfies the statutory preference for treatment as the principle element. Treatment technologies were evaluated with regard to this criterion in 1999 FFS and accepted as being effective in making the sludge critically safe, reducing flammable gas generation, and eliminating the reactivity/pyrophoricity associated with metal fines. The overall activity of radionuclides in the sludge, which is the primary risk, would remain unchanged. Final treatment and packaging for disposal of the sludge would significantly reduce the sludge contaminant mobility. Treatment also could, depending on the treatment technology implemented, reduce waste volume. Conversely, there could be an increase in waste volume depending on the sludge treatment and packaging process used (e.g., solidification), although potential receiving facilities are expected to be able to accommodate this volume of waste through the use of waste forecasts.

Summary. Through treatment, Sludge Alternative 2 greatly reduces sludge contaminant mobility and its intrinsic hazards thereby increasing overall environmental protectiveness

5.2.5 Short-Term Effectiveness

Alternative 2 would achieve a more protective sludge waste form early since it is integral the sludge removal operations.

Protection of Public and Environment. Sludge Alternative 2 treatment more quickly achieves a protective waste form that reduces potential public or environmental exposure and provides for safer waste handling. This alternative has a slight potential to affect the offsite public, environment, and onsite worker through airborne release of offgases containing radioactive and/or chemical contaminants during sludge removal and treatment. None of the treatment technologies associated with this alternative are expected to pose significant risks, and air emission treatment systems would be used to minimize impacts. The treatment system would be designed with a ventilation system to meet ARARs for airborne emission control technology for onsite facilities. Treatment at offsite facilities would comply with all permit and procedural requirements. Process controls and safety control technology would be established before treatment begins that would identify and mitigate any potential risks to the public and workers.

Protection of Workers. The sludge presents a radiological hazard to workers during treatment and transportation. Reduction of handling (i.e., containerization, transport, interim storage, and retrieval for later treatment) and transport of untreated sludge would reduce the lifecycle of worker risks. Workers could be affected by chemical or radiation exposure and/or industrial hazards during the treatment and packaging process. The treatment process could use nonradioactive process chemicals that could be hazardous to workers [e.g., nitric acid, nitric/hydrofluoric acid, oxalic acid, iron, depleted uranium, sodium hydroxide, sodium nitrite, and grout formers (dust hazard)]. Physical hazards to workers could include pressurized vessels and piping, rotating equipment (pumps, centrifuge, and fans), vehicular traffic, and electrical hazards associated with equipment. Construction hazards could exist associated with installing the treatment system. Risks are addressed by more detailed safety analysis reports and health and safety plans before construction and operation. Engineering controls such as shielding and remote operations, administrative controls, monitoring, and personal protective equipment would be used to minimize risks to workers and to ensure that worker radiation exposures remain ALARA. After treatment, chemical and physical hazards of the sludge would be significantly reduced.

Schedule. Alternative 2 supports a sludge treatment start date of February 2007 (Tri-Party Agreement Milestone M-034-30) and be complete by October 2007 (Tri-Party Agreement Milestone M-034-31). Earlier treatment reduces the time required to meet RAOs.

Summary. Sludge Alternative 2 demonstrates short-term effectiveness by speeding up sludge treatment and packaging that converts sludge into a safe and stable waste form suitable for disposal. Sludge treatment is scheduled to be completed by October 2007.

5.2.6 Implementability

Alternative 2 is technically and administratively feasible. The implementability of sludge treatment technologies (chemical, physical, solidification, thermal treatment) was evaluated in the 1999 FFS and the treatment technologies were found implementable.

Technical Feasibility. The sludge treatment technologies are the same as those described in the 1999 FFS and have been found implementable. These treatment technologies can be constructed readily at 100 K Area or another 200 Areas facility to facilitate sludge treatment soon after removal from the basins. Significant technology problems during operations are not anticipated. Further characterization of K Basins sludge is not currently considered necessary to determine the technical feasibility of the technologies and to identify appropriate process and safety controls. The sludge treatment and packaging process would meet WAC for disposal at an off-Hanford Site disposal unit as radioactive waste. Until disposal at an off-Hanford Site repository, an interim storage capacity for untreated sludge ('lag storage') would be available at a 200 Areas storage facility. Although the exact design of the sludge treatment process(es) has not yet been defined and K Basin sludge is a unique waste form, the sludge treatment technologies that would be used in the process(es) present few technical uncertainties that could result in schedule or cost impacts.

Administrative Feasibility. Overall, this alternative is administratively feasible and consistent with proposed Tri-Party Agreement milestones. Because treatment technologies have been designed to meet ARARs for onsite treatment and permit and procedural requirements for offsite treatment, few regulatory constraints based on sludge designation are anticipated. Because this alternative requires formal approval of offsite repository WAC, cost and schedule could be impacted if WAC approval is delayed, if new requirements for treatment and packaging are specified, or if sludge is assigned a different waste classification.

Summary. In general, there is a high degree of certainty that this alternative is technically and administratively implementable. There are no administrative issues deemed to have unacceptable risks. Technologies required for treatment of sludge have previously been shown to be implementable.

5.2.7 Cost

Sludge retrieval costs are a common element for the new and prior sludge alternative that were evaluated and accepted by the prior ROD and so will not be restated here. Alternative 2 costs for sludge treatment and packaging for off-Hanford Site disposal soon after removal are as follows:

Immobilization Design/Procure	$54 Million
Immobilization Installation	2 Million
Immobilization Operations	5 Million
Immobilization Container Storage	7 Million
Total Sludge Treatment	$68 Million

These costs do not include contingency, escalation, transport costs to the treatment facility, project management, or regulatory and environmental support. Until sludge is transported for offsite disposal, an interim storage capacity for untreated sludge ('lag storage') will be available at a 200 Areas storage facility that could increase the cost of this alternative.

5.2.8 Washington State Acceptance

Washington State concurred with the sludge removal activities and treatment technologies common to Alternatives 1 and 2 via the 1999 ROD. Because Alternative 2 enables earlier treatment and disposal of sludge than the previously approved remedy, Washington State has been supportive of Alternative No. 2. This Addendum will be provided to Washington State for review and concurrence. State of Washington acceptance will be further evaluated after public review of the Proposed Plan based on this Addendum.

5.2.9 Community Acceptance

Community acceptance of sludge removal and treatment technologies was expressed during the public comment preceding the 1999 ROD. Ongoing dialogue with the community since then has shown continued support for removal and treatment sooner rather than later, and for off-Hanford site disposal rather than storage. However, community acceptance will be evaluated after public review of the new Proposed Plan based on this Addendum is completed.

5.3 DETAILED ANALYSIS OF NEW DEBRIS ALTERNATIVE 2

This section provides detailed analysis of new Debris Alternative 2 (Leave Some Debris in Basins and Grout) against the nine CERCLA evaluation criteria. Debris Alternative 2 is similar to Debris Alternative 1 except that under Alternative 2 some below-water debris would remain in the basins to be encapsulated in a grout matrix and removed later. There is no change from the 1999 FFS for above-water debris that would be removed from the basins. A key component of this Alternative is grouting of the remaining debris in conjunction with basin deactivation. Debris would be removed as an integral portion of the basin structures that would be removed under Tri-Party Agreement M-34-22 and M-34-00A milestone changes (outside the scope of this Addendum).

5.3.1 Overall Protection of Human Health and the Environment

Alternative 2 provides the same overall protection of human health and the environment as Alternative 1 evaluated in 1999 FFS with regard to above-water debris that would be removed and treated, as appropriate, to meet ERDF WAC. Alternative 2 increases the quantity of debris that would remain in the basins. However, the reduced handling of this debris by leaving it in place in the basins would greatly minimize exposure threats. Encapsulating the debris in grout in conjunction with basin deactivation would substantially shield potential receptors and eliminate exposure routes until removal of the basins. This would enhance overall protectiveness until final debris removal along with the basin structures in accordance with the accelerated basin removal under M-34-32 and M-34-00A milestones. Prior to grouting, below-water debris would be processed as necessary (rinsed, void spaces addressed) to ensure that the basin structure waste stream would meet ERDF WAC. This alternative is consistent with the approach outlined in Tri-Party Agreement Change Number M-34-04-01 that expedites the schedule for removal of the basins, thereby accelerating removal of the already reduced hazards associated with the debris matrix.

5.3.2 Compliance With ARARs

Alternative 2 is designed to comply with all ARARs (Appendix A). After debris removal as part of the basin structures, the grouted debris would be designated in accordance with solid, dangerous, and radioactive waste and PCB management requirements and disposed at facilities approved to accept the assigned waste designation.

Summary. The Debris Alternative 2 would meet all ARARs without waivers.

5.3.3 Long-Term Effectiveness and Permanence

Alternative 2 would provide long term effectiveness and permanence. Any hazardous substances on debris remaining in the basins would be immobilized by grouting that would affix any smearable radiological contamination, minimize mobility, and shield workers from exposure thereby reducing the degree of hazard while awaiting debris removal to an approved disposal facility. After completion of this remedy (and removal of grouted debris) no risk would remain at the site to human or ecological receptors from untreated debris. Until basin removal, physical barriers (fence) and administrative controls would remain in place to control access by unauthorized individuals. Basin and debris removal will be expedited under Tri-Party Agreement M-34 milestones changes permanently reducing the risk of further releases to the environment earlier than would otherwise occur.

Summary. Overall, Alternative 2 provides good long-term effectiveness and permanence. Although underwater debris would remain in the basins longer than under Alternative 1, the degree of hazard while awaiting disposal integrated with basin removal would be mitigated by physical (e.g., grouting, fences) and administrative controls and the debris hazard would be permanently eliminated earlier by expedited removal and disposal of basin structures under Tri-Party Agreement M-34 milestone changes.

5.3.4 Reduction in Toxicity, Mobility, and Volume Through Treatment

Alternative 2 performs very well against this criterion. Alternative 2 leaves underwater debris to be encapsulated in grout in conjunction with basin deactivation. The grout component significantly reduces the mobility of any radiological contamination on basin debris and reduces radiation levels in the basins. This Alternative reduces the volume of debris requiring separate decontamination and disposal by its incorporation into the fixed volume of grout and basin structure debris. Treatment of below-water debris in preparation for grouting, would generate less treatment residues than piece by piece debris decontamination for disposal. Debris removal would be expedited by removal of the basin structures in accordance with the accelerated schedule for the removal of the basin structures under Tri-Party Agreement M-34 milestone changes. Because basin and debris removal would be expedited, long-term reliability considerations for surveillance and maintenance controls, including monitoring, are minimized.

Summary. Overall, leaving some debris in the basins to be grouted and removed along with the basins performs very well against this criterion. Debris Alternative 2 significantly reduces the volume of debris requiring piece by piece decontamination and disposal thereby also reducing the quantity of debris treatment residuals. Although contaminated debris is left in the basins longer, the associated grouting of this debris provides radiological shielding and reduces contaminant mobility significantly.

5.3.5 Short-Term Effectiveness

Protection of Public and the Environment. Alternative 2 would achieve a more protective end state for the basins earlier by integrating basin debris removal with the removal of the basin structure that will occur on an accelerated schedule. The activities and therefore the risks to the public and the environment under Alternative 2 are similar to Alternative 1 for above-water debris. For below-water debris Alternative 2 is more effective in protecting workers, public, and the environment. Less debris would require removal, packaging, and transport thereby reducing the potential for upset conditions and airborne releases of contaminants during such activities. Adverse environmental impacts would be minimized by encapsulating the debris in grout thereby reducing risk to the public from upset conditions and non-routine releases during debris removal and disposal. Until being grouted, some contaminated debris would remain in the basins that are a physically and administratively controlled location.

Protection of Workers. Debris Alternative 2 reduces potential risk to workers. Personnel risks are reduced by leaving some debris in the basins that reduces hands-on debris decontamination, packaging, transport, and disposal. Risk associated with radioactive exposure to untreated debris in the basin would be mitigated by encapsulating the debris in grout that provides radiological shielding. The grouting would be performed from a distance thereby keeping worker radiological exposures ALARA. The grouted debris would be removed mechanically along with the basin structures and transported in bulk quantity with a minimum of hands-on activity, greatly reducing exposure at the time of disposal. Grouting, engineering controls, monitoring, personnel protective equipment, and administrative controls would be used to keep worker and environmental exposures ALARA.

Schedule. The schedule for Alternative 2 extends the period in which contaminated debris would remain in the basins but expedites the overall schedule for removal of grouted-in debris by accelerated removal of the basin structures under M-34 milestone changes.

Summary. Alternative 2 greatly minimizes risks to workers, public, and the environment by eliminating the activities associated with separately removing and disposing of debris. Risks from allowing contaminated debris to remain in the basins longer are mitigated by the grout shielding and by expediting the overall basin removal schedule.

5.3.6 Implementability

Technical Feasibility. The processes for removal of above-water debris under Debris Alternative 2 are same as for Alternative 1 that were evaluated in the 1999 FFS. Alternative 2 simplifies debris removal by leaving some below-water debris in the basins to be grouted and removed along with the basin structure. No specific technology is involved with leaving the debris in the basin. Treatment required before grouting for disposal at ERDF is expected to be limited to removal of void spaces and washing of some debris. Therefore, there is little likelihood of difficulties or delays due to technical problems or uncertainties. A key component of this alternative is debris grouting that would be integrated with basin grouting activities that are a precursor to basin removal. These grouting activities are feasible and no significant technical difficulties are anticipated with grouting technology that is well-established, readily available commercially, and operationally simple requiring minimal unique operator training or qualification.

Administrative Feasibility. Overall, Debris Alternative 2 is administratively feasible. Integration of debris grouting with basin deactivation activities is established in interface agreements. Coordination with the ERDF and the Solid Waste Programs for transport and disposal of the grouted-in debris is addressed by interface control agreements between different Hanford Site organizations. Qualification of the grouted debris for the ERDF does not pose an administrative challenge as this waste form is readily acceptable at ERDF that has sufficient capacity to accept the waste.

Summary. Certainty is high that Alternative 2 is technologically and administratively implementable. There are no technical or administrative feasibility impediments to leaving debris in the basins. There are no technical or administrative problems with the debris grouting process or with disposal of the grouted debris.

5.3.7 Cost

The cost of removal, treatment, packaging, transport, and storage or disposal of all basin debris under Alternative 1 was calculated to be approximately $19 million. The above-water debris would be removed from the basins under both Alternatives 1 and 2 at an estimated cost of approximately $9 million. The below-water debris that would be left in the basins under Alternative 2 represents the vast majority of the highly contaminated debris. No incremental cost would be added by leaving this debris in place under Alternative 2 because the cost of removing the grouted debris as an integral portion of the basin structure is already incorporated into basin deactivation and removal costs. Debris Alternative 2 would eliminate the cost of piece by piece debris removal, decontamination, packaging, and disposal for a reduction of approximately 100,000 labor hours and an overall cost savings of approximately $10 Million. Consequently, Alternative 2 represents a cost saving while greatly reducing worker exposure. Further, the grouted debris would be removed using mechanical methods and transported in bulk along with basin structures making debris disposal safer, more efficient, and more economical.

5.3.8 Washington State Acceptance

Washington State has already accepted the above-water debris management component of this remedy alternative. Washington State acceptance of below-water debris management will be further evaluated after review of the new Proposed Plan.

5.3.9 Community Acceptance

Community acceptance of the above-water debris management component of this alternative was gained via the public review of the 1999 Proposed Plan. Community acceptance of below-water debris management will be further evaluated after this public review of the new Proposed Plan.

6.0 COMPARATIVE EVALUATION OF ALTERNATIVES

This section compares the sludge and debris remedies previously selected by the 1999 ROD to new Sludge Alternative 2 (Remove and Treat) and new Debris Alternative 2 (Leave Some Debris in Basins and Grout) analyzed in Section 5.0 and identifies recommended alternative(s).

6.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Sludge. Sludge Alternatives 1 and 2 both achieve overall protection of human health and the environment by removing sludge from the basins and the proximity of the Columbia River. Alternative 1 did not specify treatment and so the intrinsic risks of interim storage of untreated sludge would remain after completion of the interim action. Alternative 2 provides for sludge treatment and packaging for off-Hanford Site disposal as an integral part of sludge removal that permanently eliminates potential exposure routes upon completion of this alternative. No alternative satisfied a ROD preference to treat sludge using a treatment alternative that could take full advantage of economies of scale presented by combining sludge treatment with other large capacity treatment processes under development onsite. However, such a sitewide treatment system is not currently available.

Debris. Debris Alternatives 1 and 2 both remove all contaminated debris for disposal and provide equivalent equal overall protection of human health and the environment upon completion of the remedial action.

6.2 COMPLIANCE WITH ARARS

Sludge. Sludge Alternatives 1 and 2 both meet ARARs identified in Appendix A. However, Alternative 2 meets the statutory preference for treatment.

Debris. Debris Alternatives 1 and 2 both meet ARARs identified in Appendix A.

6.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

Sludge. Sludge Alternative 1 contains uncertainty regarding how long untreated sludge would remain in interim storage and when sludge would eventually be treated. Alternative 2 provides better long-term effectiveness by providing the permanent solution of treatment for disposal soon after removal.

Debris. Debris Alternatives 1 and 2 both provide long-term effectiveness. However, Alternative 2 does so while reducing the quantity of debris requiring piece by piece decontamination, removal, and disposal.

6.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

Sludge. Sludge Alternative 1 provides a temporary reduction of sludge contaminant mobility by storing sludge in containers at T Plant Complex but does not include treatment and disposal that would permanently eliminate the sludge hazards. Although a final treatment system or a hybrid combination of the treatment technology alternatives described in the 1999 ROD is not yet defined, Sludge Alternative 2 provides for treatment and packaging of sludge for off-Hanford Site disposal that would permanently reduce sludge contaminant toxicity and mobility and would potentially reduce waste volume, while at the same time satisfying the statutory preference for treatment.

Debris. Debris Alternatives 1 and 2 both address above-water debris in the same manner. However, Debris Alternative 2 better manages below-water debris by leaving some debris in the basin thereby greatly reducing the quantity of debris that would require piece by piece decontamination, removal, and disposal. Because debris handling, removal, and decontamination in the basins is minimized, less secondary waste is generated requiring management. Although, Debris Alternative 2 leaves contaminated below-water debris in the basin longer, the risks are mitigated by grouting the debris for radiological shielding in conjunction with basin deactivation and expediting debris removal by accelerated removal of the basins under Tri-Party Agreement M-34 milestone changes.

6.5 SHORT-TERM EFFECTIVENESS

Sludge. Sludge Alternative 1 removes sludge from the K Basins but does not provide for its treatment for disposal thereby postponing final sludge disposition. Sludge Alternative 2 finally dispositions sludge through treatment for disposal at the 100 K Area or a 200 Areas facility soon after removal. This provides better short-term effectiveness in protecting workers, the public, and the environment from the threat of releases during handling and transport of untreated sludge that would have occurred under Alternative 1. Sludge Alternative 2 expedites the overall schedule for sludge treatment and disposal thereby expediting completion of the project and reducing the time required to meet RAOs.

Debris. Debris Alternatives 1 and 2 both reduce risks to the public and the environment equally from contaminated above-water debris. Alternative 1 exposes workers and the environment to radiological and chemical exposure risks associated with piece by piece debris removal, decontamination, packaging, transportation, and disposal. Debris Alternative 2 would leave much contaminated debris in the basin thereby eliminating these risks. Risks from contaminated debris remaining in the basin would be mitigated by encapsulating the debris in grout in conjunction with basin deactivation and with the accelerated schedule for basin removal under Tri-Party Agreement M-34 milestone changes.

6.6 IMPLEMENTABILTY

Sludge. Sludge Alternative 1 is implementable in the short term. However, Alternative 1 presents long-term implementabilty concerns because it does not address final sludge disposition and so does not address the technical and administrative feasibility issues associated with sludge treatment and disposal (e.g., interim storage, sludge retrieval, sludge transport to a treatment facility, and sludge treatment). Alternative 1 would require remobilization at some future date of technical, operations, and craft personnel that may not have direct knowledge of the materials, equipment, and processes gained from the prior sludge interim storage action. Sludge Alternative 2 includes sludge treatment as a primary component by integrating sludge treatment with sludge removal. This makes final K Basins sludge disposition a continuous, uninterrupted process and that will meet the technical and administrative challenges presented by treatment and disposal. As a unique waste form, K Basin sludge could present unforeseen technical challenges during treatment. However, use of the sludge treatment technology alternatives described in the 1999 ROD will minimize technical or administrative uncertainties associated with treatment system construction and operation and with meeting sludge treatment and disposal requirements. Although WAC for RH-TRU waste is not yet finalized, current draft WAC requirements are not expected to change to the extent that could adversely impact the schedule for treatment of sludge that is RH TRU waste.

Debris. Debris Alternative 1 requires the technically demanding piece by piece removal, decontamination, packaging, transport, and disposal of all basin debris in a safe and compliant manner. Debris Alternative 2 leaves some underwater debris in place thereby eliminating these activities for the bulk of basin debris and making this alternative the most technically and administratively feasible alternative. Debris Alternative 2 reduces the volume of debris requiring piece by piece treatment and disposal by incorporating the below-water debris into the fixed volume of grouted basin structure debris that would be removed using technically simple mechanical processes and economical bulk transportation and disposal processes.

6.7 COST

Sludge. Under Sludge Alternative 2, the cost of sludge treatment after removal (i.e., without interim storage) is estimated to be approximately $68 million. The cost of sludge interim storage (not including treatment) after removal was identified in the 1999 FFS as $90 million. Sludge Alternative 2 represents a cost savings because most of the sludge storage cost would be saved by treating sludge soon after removal.

Debris. The costs associated with piece by piece removal, decontamination, packaging, transport and disposal of all basin debris were evaluated in the 1999 FFS and expected to be approximately $19 million with removal of the above water portion being approximately $9 million of that amount. Consequently, leaving the highly contaminated below-water debris and eliminating the cost of piece by piece removal of this debris adds no incremental costs but actually provides an overall cost savings of approximately $10 million while greatly reducing worker exposure.

6.8 STATE OF WASHINGTON ACCEPTANCE

Sludge and Debris. Sludge Alternatives 1 and 2 and Debris Alternatives 1 and 2 would all satisfy the State of Washington's (State) preference to remove sludge and debris from the proximity of the Columbia River. The regulatory process for State of Washington acceptance of the new sludge and debris alternatives presented in this Addendum will involve review and consultation with EPA. This Addendum will be provided to the State of Washington for review. State of Washington acceptance will be further evaluated after public review of the Proposed Plan based on this Addendum.

6.9 COMMUNITY ACCEPTANCE

Sludge and Debris. Sludge Alternatives 1 and 2 and Debris Alternatives 1 and 2 are anticipated to satisfy the public preference that the contents of the K Basins be removed and placed in more protective facilities. Community acceptance of the new sludge and debris alternatives will be evaluated after public review of the Proposed Plan.

6.10 NEW ALTERNATIVE COMPLIANCE WITH REMEDIAL ACTION OBJECTIVES

The new sludge and debris alternatives will meet RAOs (Section 2.3). The Addendum Alternative 1 (No Change from ROD) for sludge and debris were selected by the 1999 ROD and so were shown to meet

RAOs to the degree practicable at the time. The new alternatives for sludge and debris have generally been shown to evaluate better against the nine CERCLA criteria. New Sludge Alternative 2 now meets the RAOs better by integrating sludge treatment and removal and is more cost effective by eliminating the costs of long-term interim storage of untreated sludge. New debris Alternative 2 better meets RAOs by reducing worker exposure and minimizing waste volume thereby providing the safest and most cost-effective approach for below-water debris. Although there is no one-to-one correlation between K Basin RAOs and the nine CERCLA criteria, successful evaluation against the nine CERCLA criteria adequately demonstrates that upon completion, these remedy alternatives will meet the substantive requirements of the RAOs.

6.11 SUMMARY

This Addendum provides the basis for changing the sludge treatment and debris management remedies in the K Basins interim remedial action remedy selected in the 1999 ROD. The new remedy alternatives strive to be protective of human health and the environment while complying with all applicable or relevant and appropriate state and federal requirements in the most cost effective manner. Because the new sludge and debris alternatives are an extension of remedy alternatives already shown by the CERCLA evaluation process to meet the nine CERCLA criteria and RAOs, it was expected that the remedies presented would perform well in the CERCLA evaluation process. However, the evaluation process has shown new Sludge Alternative 2 and new Debris Alternative 2 to be more favorable in achieving cleanup objectives and so adoption of these alternatives is recommended. New Sludge Alternative 2 meets the final RAO better by treating sludge soon after removal; is more cost effective by eliminating the costs of long-term interim storage; and, satisfies the statutory preference for remedies that employ treatment as a principle element. New Debris Alternative 2 better meets RAOs by reducing worker exposure and minimizing waste volume, thereby providing the safest and most cost-effective approach for management of below-water debris.

7.0 REFERENCES

61 FR 10736, "Record of Decision, Management of Spent Nuclear Fuel from the K Basins at the Hanford Site, Richland, Washington," Federal Register, Vol. 61, No. 52, Page 10736, (March 15, 1996).

DOE/EIS-0245F, *Management of Spent Nuclear Fuel from the K Basins at the Hanford Site, Richland, Washington, Addendum, Final Environmental Impact Statement*, U.S. Department of Energy, Richland, Washington.

DOE, 1996, *Waste Acceptance Criteria for the Waste Isolation Pilot Plant*, WIPP-DOE-069, Rev. 5, U.S. Department of Energy Waste Isolation Pilot Plant, Carlsbad, New Mexico.

DOE/RL-98-66, *Focused Feasibility Study for the K Basins Interim Remedial Action*, Rev 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-98-71, *Proposed Plan for the K Basins Interim Remedial Action*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington

DOE/RL-99-89, *Remedial Design Report and Remedial Action Work Plan for the K Basins Interim Remedial Action*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE, 1998, *Supplement Analysis of Environmental Effects of Changes in DOE's Preferred Alternative for Management of Spent Nuclear Fuel From the K Basins at the Hanford Site, Richland, Washington*, DOE/EIS-0245/SA1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2000, Letter (RL-00-SFO-135) from P.G. Loscoe (DOE-RL) to J.K. Bartz (Ecology) and L. Gadbois (EPA), "Transmittal of Final Laboratory Data Reports for Toxicity Characteristic Leaching Procedure (TCLP) Analyses Performed on K East (KE) Basin Sludge Samples", U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL, 2001, Letter from PG Loscoe (RL) to EPA dated March 27, 2001, "Completion of Waste Designation for K Basin Sludge Waste Streams", 01-SFO-051.

DOE/RL-2004-48, *Proposed Plan for the K Basins Interim Remedial Action*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington

DOE-RL, 2004, Letter from K. A. Klein (DOE-RL) to N. Ceto (EPA), *Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Time Critical Removal Action Memorandum for Treatment and Disposal of Sludge from the 105 K East Basin North Loadout Pit*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, EPA, and DOE, 1996, *Hanford Federal Facility Agreement and Consent Order, Fifth and Sixth Amendment February 1996*, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

EPA, 1988, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, OSWER Directive 9355.3-01, October 1988, U. S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, D. C.

EPA, 1999, *Record of Decision for the K Basins Interim Remedial Action*, US EPA, Region 10, EPA/541/R-99/059.

EPA, 2003, Letter, from C. E. Edlund, (EPA) to U.S. Department of Energy, Carlsbad Field Office, "Conditions of Approval for Disposal of PCB/TRU and PCB/TRU Mixed Waste at the U.S. Department of Energy (DOE) Waste Isolation Pilot Plant (WIPP) Carlsbad, New Mexico", U.S. Environmental Protection Agency, Region 6.

EPA and DOE, 2004, Tri-Party Agreement Change No. M-34-04-01, *Acceleration of K Basins Sludge Treatment and Disposal, Basin Remediation, and Delay in Sludge Retrieval*, U.S. Environmental Protection Agency, U.S. Department of Energy, August, 2004.

EPA, DOE, and Ecology, 1996, *Record of Decision for the USDOE Hanford 100-HR-3 and 100-KR-4 Operable Units Interim Remedial Actions*, U.S. Environmental Protection Agency, Region 10, U.S. Department of Energy, Richland Operations Office, and Washington State Department of Ecology, Richland, Washington.

HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria*, Rev. 5, Fluor Hanford, Inc., Richland, Washington.

HNF-SD-SNF-TI-009, 2001, "105K Basin Material Design Basis Feed Design for Spent Nuclear Fuel Project Facilities", Volume 2, Sludge," Volume 2, Revision 2.

HNF-SD-SNF-TI-015, 2004, "Spent Nuclear Fuel Project Technical Databook", Rev. 11, Fluor Hanford, Richland, Washington.

Mellinger, GB, CH Delegard, AJ Schmidt, and GJ Sevigny, 2004, "Evaluation and Recommendation of Waste Form and Packaging for Disposition of the K East Basin North Loadout Pit Sludge", 46857-RPT01.

SNF-7765, 2003, "Supporting Basins for SNF Project Sludge Technical Databook", Rev. 2, Fluor Hanford, Richland Washington.

SNF–16984, Rev. 0, *K-Basin Removal Evaluation,* June 2003, Fluor Hanford, Richland, Washington.

APPENDIX A

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

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COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

In general, on-site specific actions must comply with the substantive aspects of ARARs, not with corresponding administrative requirements. That is, permit applications and other administrative procedures are not considered ARARs for actions conducted entirely onsite [40 CFR 300.400(e)].

To-be-considered (TBC) information is nonpromulgated advisories or guidance issued by federal or state governments that are not legally binding and do not have the status of ARARs. As appropriate, TBCs should be considered in determining the action necessary for protection of human health and the environment. Requirements drawn from TBCs may be included in the selected alternative. Because the alternatives would result primarily in waste generation and potential for air emissions, the key ARARs proposed for the alternatives being considered include waste management standards, standards for controlling emissions to the environment, and environment, safety, and health standards. Final ARARs, which must be complied with during implementation of the selected remedial action, would be documented in the CERCLA Record of Decision Amendment. ARARs in the 1999 ROD will remain ARARs in the proposed amended ROD. Additional ARARs resulting from the expanded scope and revisions to the prior selected remedy are identified in Table A-1. The proposed ARARs are discussed generally in the following sections and are documented in detail in Table A-1.

Waste Management Standards

A variety of waste streams would be generated under the proposed remedial action alternatives. It is anticipated that most of the waste will designate as PCB remediation waste. However, quantities of LLW could be generated. The great majority of the waste will be in a solid form.

The management and disposal of PCB wastes are governed by the *Toxic Substances Control Act* (TSCA) *of 1976*, and regulations at 40 CFR 761. The TSCA regulations contain specific provisions for PCB waste, including PCB waste that contains a radioactive component.

Waste that is designated as LLW that meets ERDF acceptance criteria is assumed to be disposed at ERDF, which is engineered to meet appropriate performance standards under 10 CFR 61. Alternate potential disposal locations may be considered when the remedial action occurs if a suitable and cost effective location is identified. Any potential alternate disposal location will be evaluated for appropriate performance standards to assure that it is adequately protective of human health and the environment.

Waste designated as PCB remediation waste likely would be disposed at ERDF, depending on whether it is LLW and meets the waste acceptance criteria. PCB waste that does not meet ERDF waste acceptance criteria would be retained at a PCB storage area meeting the requirements for TSCA storage and would be transported for future treatment and disposal at an appropriate disposal facility.

CERCLA Section 104(d)(4) states that where two of more noncontiguous facilities are reasonably related on the basis of geography, or on the basis of the threat or potential threat to the public health or welfare or the environment, the facilities can be treated as one for purposes of CERCLA response actions. Consistent with this, the K Basins and ERDF would be considered to be onsite for purposes of Section 104 of CERCLA, and waste may be transferred between the facilities without requiring a permit.

All alternatives would be performed in compliance with the waste management ARARs. Waste streams would be evaluated, designated, and managed in compliance with the ARAR requirements. Before disposal, waste would be managed in a protective manner to prevent releases to the environment or unnecessary exposure to personnel.

The specific requirements pertaining to waste management for this action are in Table A-1.

Standards Controlling Emissions to the Environment

The proposed remedial action alternatives have the potential to generate airborne ambient emissions of both radioactive and criteria/toxic emissions.

The federal Clean Air Act of 1990 and Amendments (42 United States Code 7401 et seq.), and the Washington Clean Air Act (RCW 70.94) require regulation of air pollutants. Under federal implementing regulations, the Title 40 CFR Part 61, Subpart H requires that radionuclide airborne emissions from the facility shall be controlled so as not to exceed amounts that would cause an exposure to any member of the public of greater than 10 millirem per year effective dose equivalent. The same regulation addresses point sources (i.e., stacks or vents) emitting radioactive airborne emissions, requiring monitoring of such sources with a major potential for radioactive airborne emissions, and requiring periodic confirmatory measurement sufficient to verify low emissions from such sources with a minor potential for emissions. Under portions of the state implementing regulations, the federal regulations are paralleled by adoption, and in addition more specifically address control of radioactive airborne emissions where economically and technologically feasible [WAC 246-247-040(3) and –040(4) and associated definitions]. In order to address these requirements, best or reasonable control technology would be addressed by ensuring that applicable emission control technologies (those reasonably operated in similar applications) would be utilized when economically and technologically feasible (i.e., based upon cost/benefit). If it is determined that there are requirements for monitoring of minor point sources and fugitive or non-point sources emitting radioactive airborne emissions [WAC 246-247-075(8)], then these would be addressed by sampling the effluent streams and/or ambient air as appropriate using reasonable and effective methods.

The federal implementing regulations also contain requirements for managing asbestos material associated with demolition and waste disposal (Title 40 CFR Part 61, Subpart M).

The specific requirements pertaining to radioactive and nonradioactive air emissions for this action are in Table A-1.

Table A-1. Identification of Applicable or Relevant and Appropriate Requirements and To Be Considered Information for K Basins Interim Remedial Action.

ARAR citation	ARAR or TBC	Requirement	Rationale for use
5.1.2.1 WASTE MANAGEMENT STANDARDS			
Regulations pursuant to the *Toxic Substances Control Act (TSCA)*, 15 USC 2601 et seq			
Polychlorinated Biphenyls Manufacturing, Processing, Distribution in Commerce, and Use Provisions (40 CFR 761)			
PCB Waste Management and Disposal Specific subsections: 40 CFR 761.1(b)(4) 40 CFR 761.50(b)(3) 40 CFR 761.50(b)(7) 40 CFR 761.50(c) 40 CFR 761.61(a)(4) 40 CFR 761.61(c)	ARAR		These regulations are applicable to the onsite storage and disposal of PCB remediation waste which for this remedial action is sludge. In addition, sludge is a multi-phasic waste as described in 40 CFR 761.1(b)(4). The specific identified subsections from 40 CFR 761.50(b) reference the specific sections for management of each PCB waste type. Radioactive PCB waste can be disposed in accordance with 40 CFR 761.50(b)(7). PCB remediation waste may be disposed of in a different manner than prescribed in 40 CFR 761. This alternative disposal is achieved by providing information to receive a risk-based disposal approval, 40 CFR 761.61(c).
To-Be-Considered pursuant to relevant facility acceptance criteria			
Environmental Restoration Disposal Facility Waste Acceptance Criteria (BHI-00139)	TBC	This document establishes waste acceptance criteria for ERDF.	Waste destined for management at ERDF must meet acceptance criteria to ensure proper disposal.
Contact-Handled Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant (DOE/WIPP-02-3122)	TBC	This document establishes waste acceptance criteria for WIPP	Contact-handled TRU waste destined for management at WIPP must meet acceptance criteria to ensure proper disposal.
Remote-Handled Transuranic Waste Characterization Program Implementation Plan for the Waste Isolation Pilot Plan (DOE/WIPP-02-3214)	TBC	This document establishes waste acceptance criteria for WIPP	Remote-handled TRU waste destined for management at WIPP must meet acceptance criteria to ensure proper disposal.
5.1.2.2 STANDARDS CONTROLLING EMISSIONS TO THE ENVIRONMENT			
Regulations pursuant to the *Clean Air Act of 1977*, 42 USC 7401, et seq., as amended			
"National Emission Standards for Hazardous Air Pollutants" (40 CFR 61)			
40 CFR 61.92	ARAR	Emissions of radionuclides to the ambient air shall not exceed amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr.	Substantive requirements of this standard are applicable because this remedial action may include onsite activities such as decontamination and stabilization of contaminated structures, treatment of sludge, and operation of exhausters and vacuums, each of which may provide airborne emissions of radioactive particulates. As a result, requirements limiting emissions apply.

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CERCLA Section 104(d)(4) states that where two of more noncontiguous facilities are reasonably related on the basis of geography, or on the basis of the threat or potential threat to the public health or welfare or the environment, the facilities can be treated as one for purposes of CERCLA response actions. Consistent with this, the K Basins and ERDF would be considered to be onsite for purposes of Section 104 of CERCLA, and waste may be transferred between the facilities without requiring a permit.

All alternatives would be performed in compliance with the waste management ARARs. Waste streams would be evaluated, designated, and managed in compliance with the ARAR requirements. Before

This paper addresses environmental regulatory issues concerning the use of CERCLA non-time critical removal action authority for decommissioning 200 Area S&M Buildings. Also included are EP recommendations and pertinent requirements.

(Q) What can be done under the permit exemption, prior to AM?

(A) Activities necessary to:

- determine the nature and extent of contamination (i.e., RSEs & on-site IDW management)
- on-site treatability studies.

(Q) Can S&M be done under the permit exemption?

(A) Yes. However, some activities should not proceed until an AM is issued.

If conducted under CERCLA authority, some S&M activities could be considered removal actions (i.e., activities to abate, prevent, minimize, stabilize, mitigate, or eliminate threats to human health or the environment). These activities (i.e., NTCRAs) should not proceed under CERCLA authority (and the permit exemption) without processing an EE/CA. [40 CFR 300.415(b)(3) & (4) and 40 CFR 300.415(e)].

The NCP and DOE G 430.1-4 stipulate that non-CERCLA regulations and authorities may be appropriate for responding to some hazards [40 CFR 300.415 (b)(2)]. In such instances, CERCLA authority and the associated permit exemption would not apply. Note: S&M activities have been, and could continue to be, performed under non-CERCLA regulations and authorities.

Note: CERCLA has its own administrative permit-like process (i.e., regulator review/approval & public comment). In some cases, the CERCLA administrative process may be more burdensome than the non-CERCLA process.

(Q) Are S&M Buildings part of the 200 Area NPL and therefore under CERCLA?

(A) No.

Documentation in the TPA Action Plan, Appendix C, and the Administrative Record do not currently include the S&M buildings as part of the 200 Area NPL. To take this position is risky, because it is inconsistent with one of the primary