The Secretary of Energy
Washington, DC 20585

November 28, 2005

The Honorable A. J. Eggenberger
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, N.W., Suite 700
Washington, DC 20004-2901

Dear Mr. Chairman:

This letter transmits the revised Department of Energy's Implementation Plan (IP) for stabilization of the nuclear materials identified in Recommendation 2000-1. The revision is specific to the Hanford Section of the IP.

The update to the IP reflects new information on the techniques necessary to safely handle the sludge in the K Basins at Hanford and appropriate contingency for the risks to the project.

If you have any further questions, please contact me or Mr. James A. Rispoli, Assistant Secretary for Environmental Management, at (202) 586-7709.

Sincerely,

Samuel W. Bodman

Enclosure

05.1718

PRIORITIZATION FOR STABILIZING NUCLEAR MATERIALS

DNFSB RECOMMENDATION 2000-1

IMPLEMENTATION PLAN

REVISION
TO
SECTION 5.1 HANFORD

November 2005

Executive Summary

Nuclear materials that are weapons-useable, or that pose significant safety concerns (e.g., criticality) have been the focus of many interactions between the Department of Energy (DOE) and the Defense Nuclear Facilities Safety Board (DNFSB). Key documents assessing these issues are DOE's vulnerability reports of the mid-1990's and the DNFSB's Recommendations 94-1 and 2000-1, *Prioritization for Stabilizing Nuclear Materials*. The updated Implementation Plan (IP) submitted in May 2004 represented an accelerated decommissioning of the K-East Basin and treatment and packaging of the sludge for disposal from previous plans. The May 2004 update followed the policy of providing near best-case estimates of performance and did not incorporate a rigorous level of risk mitigation.

The Richland Operations Office's (RL) K-Basins Closure (KBC) Project has recently missed commitments under the updated IP. Multiple factors have contributed to missing these commitments that primarily were caused by:

1. A project-level breakdown of Integrated Safety Management (ISM),
2. Weaknesses in the areas of engineering, design, and testing,
3. Weaknesses in the application of basic project management principles, and
4. Overly aggressive commitments based on optimistic assumptions with project contingency to mitigate potential risks.

The following modification provides commitment dates and a new cost and schedule baseline, which reflect a project recovery plan employing the current technical approach, while appropriately accounting for mitigation of identified project risks. The commitment dates are based on a rigorous and formal risk assessment process.

Technical Justification of
K-Basins Sludge Changes to the 2000-1 Implementation Plan

Introduction

The K-Basins Closure (KBC) Project has recently missed commitments under the 2000-1 Implementation Plan (IP). Multiple factors have contributed to missing these commitments that primarily were caused by:

1. A project-level breakdown of Integrated Safety Management (ISM),
2. Weaknesses in the areas of engineering, design, and testing,
3. Weaknesses in the application of basic project management principles, and
4. Overly aggressive commitments based on optimistic assumptions with project contingency to mitigate potential risks.

The following sections describe the factors that have caused delays, the corrective actions that have or are being taken, and provide the basis for the changes being made to the IP. Although improvements toward meeting commitments have been made, additional improvements from some of the current corrective actions will not be realized immediately. Follow-on assessments, as well as new corrective actions and project improvements, will continue as problems arise or potential problems are identified. Both Department of Energy (DOE) and Fluor Hanford, Inc. (FHI) have focused and committed a high level of resources to ensure these new commitments are met.

Project Management Weaknesses

Schedule Commitments

In the past, Defense Nuclear Facilities Safety Board (DNFSB) commitments for K-Basins were determined by using schedules that were very aggressive and represented a near best-case solution. While knowledge of different project risks and their resulting impacts was available, this information was not fully considered when determining DNFSB commitments for K-Basins. This was a project management failure resulting from inadequate implementation of the defined project management processes since an analysis of the project risks was not adequately performed and adequate mitigation measures were not identified and applied. The updated IP submitted in May 2004 represented an accelerated decommissioning of the K-East Basin and treatment and packaging of the sludge for disposal from previous plans. The May 2004 update followed the policy of providing near best-case estimates of performance and did not incorporate a rigorous level of risk mitigation. This was a result of the policy to aggressively pursue completion of DNFSB recommendations. The current update, however, has been developed with full consideration of project risks and potential impacts.

In general, the technical approach described in the May 2004 update is still valid. However, because of the factors that caused commitments to be missed, DOE believes some changes to the sludge collection techniques are warranted and that the commitment dates need to be adjusted. DOE remains committed to our previous policy of aggressively pursuing and completing DNFSB recommended actions; however, it is more appropriate to drive aggressive performance by

accelerating completion expectations using contractual processes rather than making commitments that do not properly account for project risks.

The changes to the IP commitments are based on an industry accepted formal risk assessment process. This risk assessment process identifies potential project risks and prioritizes those risks based on the probability of occurrence and consequence. Specific mitigations were developed for higher risk activities with appropriate resources and schedule contingency identified. The result of the risk assessment is documented in the Project "Risk Matrices" and will be updated regularly. These matrices provide part of the justification for the commitment revisions in the IP.

Project Structure Improvements

The KBC Project has also made organizational improvements, including an alignment of the work force with the activities in each facility and the assignment of experienced corporate senior management. The new structure allows the Director for each facility to integrate sludge and decontamination and decommissioning activities along with facility routines to safely follow the integrated schedule. The Project has also implemented a dynamic prioritization system that ensures critical path work is given the highest priority. Clearly communicating the Project priorities allows resource allocation decisions and work reassignments to be made consistently and at the lowest level in the organization, improving the efficiency of priority decisions.

The Assistant Secretary for Environmental Management is committed to the use of sound project management principles. DOE will be assigning a senior manager capable of achieving Level 4 Federal Project Director certification to manage the Project by the end of this year.

Project Level Breakdown of ISM

Containerization of sludge in the K-East Basin is currently being performed. However, progress has been significantly slower than originally scheduled. The start of sludge containerization was delayed about 30 days due to delays in completing removal of the last few hundred spent fuel assemblies that were extremely degraded and more problematic than the greater than 100,000 spent fuel assemblies already removed. The original schedule showed that containerization would take only 2 months to complete. The schedule had relied on experience gained while vacuuming sludge from the tops of fuel canisters as part of fuel removal. That experience showed that sludge was highly mobile, relatively soft in consistency, and easy to relocate within the basin. The experience was only representative of a small part of the actual sludge conditions and did not provide a complete and accurate scope of the project.

The as-found sludge conditions require different collection techniques and equipment. The differing sludge conditions have been addressed through a systematic approach, including an extensive value engineering study that heavily relied upon the workers for input and vetting of possible solutions. Actions that have been implemented to address actual sludge conditions include multiple pumping systems to collect sludge simultaneously; use of underwater cameras to overcome poor visibility; improving sludge vacuum system end effectors; removing fuel racks and large debris from the basin to minimize interference to vacuuming sludge; and the design, manufacture, and delivery of special tooling to facilitate sludge collection in difficult basin

conditions. To improve water quality, changes to improved ion exchange resins, filtration, operational improvements, and sequencing of underwater work were all deployed. A value engineering study was also conducted to identify safety improvements in the sludge containerization process, including the suspension of tooling from trolleys to reduce the physical strain on the workers and removing large or awkward debris rather than relocating it many times. System design has been updated to minimize the impact of frequent filter changes and special tooling has been, and continues to be, designed to meet the unique sludge collection challenges posed in different areas of the basin and adjacent pits. These changes have been incorporated to accurately describe the scope of the project and represent a 21-month change from the original duration.

Improvements Made for Poor Performance in the Areas of Engineering, Design, and Testing

In April 2003, the contractor prematurely declared readiness for startup and operation of the Sludge Water System (SWS) at K-East Basin. The contractor immediately halted the Operational Readiness Review (ORR). RL directed the contractor to prepare a corrective action plan to rectify issues associated with the SWS. The contractor conducted a causal analysis and issued a Broader Scope Issues Report that identified deficiencies in the areas of engineering, design, testing, and project management. Numerous corrective actions were developed and have been tracked through the contractor's Deficiency Tracking System. In March 2005, the contractor performed an independent assessment to evaluate effectiveness of the Broader Scope Issues Report corrective actions. RL oversaw this review. The review indicated that although technical and engineering improvement opportunities exist, the fundamental engineering and project management issues that led to the inability to complete the first SWS ORR have been largely resolved. Corrective actions from the Broader Scope Issues Report and the Effectiveness Review are complete, with the exception of a scheduled followup assessment for one of the corrective actions. In general, the independent assessment determined that corrective actions from the Broader Scope Issues Report were effective, although some corrective actions have not been in place long enough to verify the results are satisfactory. These actions will be revisited by March 2006.

Additionally, deficiencies identified in the 2003 contractor ORR have been addressed and corrected as evidenced by three successful startups. The contractor completed the SWS ORR followed up by a DOE ORR in July 2004. The contractor successfully demonstrated the readiness to start and operate the SWS to containerize North Load Out Pit sludge. Additionally, in October 2004, the contractor led a successful Readiness Assessment (RA) to start operation of the Sludge Containerization System (SCS) to capture the balance of K-East sludge. Again in July 2005, the contractor performed a successful RA to start up the Fuel Transfer System. These three successful startups are a clear indication that many of the identified issues from the April 2003 ORR have been corrected.

In July/August 2003, compensatory engineering measures were put in place for the SWS Project. The primary measure was the requirement for all design documentation to be reviewed by the Central Engineering organization. Over the next 18 months, well over 300 sludge related Facility Modification Packages (FMPs) were reviewed by the Central Engineering organization. Additionally, Central Engineering conducted two Management Assessments of design documentation for all of FHI. Central Engineering staff members evaluated the data and

concluded that the removal of the compensatory Central Engineering review requirement was warranted. Central Engineering has since continued to provide technical reviews upon request but is no longer a mandatory reviewer.

To institutionalize these improvements, FHI procedure HNF-PRO-2001 was revised to require Central Engineering discipline manager(s) to be included on distribution for all approved FMPs to allow Central Engineering to continue to perform "spot check" post-reviews of at least 10 percent of released FMPs, including sludge FMPs and others released by the KBC Project. Minor deficiencies have been noted, but no significant degradations in performance that would warrant programmatic or project level corrective actions have been discovered. Central Engineering also performs an annual Assessment of the FMP process for all Projects, including KBC. Improvements were noted in the 2004 review compared to the 2003 Assessment. The next Assessment is scheduled for the October/November 2005 timeframe. Finally, the Central Engineering discipline managers have been actively engaged in engineering reviews and other activities associated with the KBC/Sludge Project.

More recently, DOE has performed key technical reviews that assessed the contractor's effectiveness in corrective actions related to design, engineering, testing, and project management. One of those reviews was a technical assessment of the hose-in-hose (HIH) system for transferring K-East Basin sludge to K-West Basin. All of the findings and most of the observations have been closed. The remaining observations will be closed prior to transferring sludge. Another review was performed by a DOE Office of Environmental Management-Headquarters (EM-HQ) chartered Sludge Review Board (SRB) for the entire Sludge Retrieval and Disposition Project (SRDP). The primary objective of the SRB was to determine whether or not there is an adequate technical basis, including sludge characterization data, to process sludge in a safe and predictable manner. The SRB also reviewed the effectiveness of certain aspects of Integrated Safety Management System functions as applied to the SRDP, particularly in the areas of design, engineering, and testing. An extensive volume of technical documentation associated with sludge characterization and system designs for moving and treating the sludge was reviewed. The SRB conclusion from this review was that sufficient knowledge of sludge characteristics is available to design safe processes for the collection, transfer, and treatment of K-Basins sludge. However, there were several issues identified for further evaluation by FHI and RL to increase the likelihood that the project will be effective. These were captured in the twelve SRB recommendations; for which FHI has developed a set of responses. These recommendations were provided to improve sludge systems design, testing, and operation. Seven of these recommendations either have been completed or are being evaluated for completion and the actions have been implemented and are continuing. One of the open recommendations deals with developing a conservative process control plan and requires resolution prior to sludge transfers. Two other open recommendations require resolution prior to operations and deals with establishing an expert-based operating methodology and establishing a more formal startup and acceptance process for the treatment system. The last open recommendation deals with enhancing the formality and discipline of the engineering and test program. Some actions that have already been taken include issuing the treatment system functional design criteria, the assignment of a responsible design authority, and scheduling design reviews of the treatment system. An integrated test plan is still being developed and a causal analysis and corrective actions are being written to address identified problems with the treatment

system engineering. DOE is also planning additional design reviews of the treatment system and a regulatory review of the treatment process.

The program has also strengthened the testing program for the SRDP. A Joint Test Group has been established for sludge projects. This group, chaired by the project Chief Engineer, is responsible for oversight of the planning and execution of integrated testing of all of the sludge project systems and equipment. The Joint Test Group includes key project personnel, as well as subject matter experts from functional areas and independent test experts where appropriate. An integrated test plan for HIH and K-West floor and pit sludge retrieval has been issued and a matrix developed to ensure test requirements are tracked and documented in a test performance document. An integrated system test will be performed for the HIH subproject to demonstrate system functionality and to train operators for normal and abnormal system operation and response.

For the Sludge Stabilization and Packaging portion of the project, FHI has revised its contract with British Nuclear Group America (BNG) to a project in which FHI manages project risks. The contractual relationship with BNG is strengthened, and FHI oversight is more formalized. The original contract was to have BNG provide a process system, equipment, install the equipment in the Cold Vacuum Drying Facility (CVDF), develop operating procedures, train FHI operating personnel, and supervise the production of the first 50 drums all under FHI oversight and management. The operation of the systems for the production drum waste would have been performed by FHI with BNG support. Under that approach, FHI (engineering and support organizations) would have involvement and review of the equipment development in an informal manner and would formally submit the Documented Safety Analysis and Environmental permitting. Acceptance of the equipment would be by inspection and performance testing.

The contract approach for sludge stabilization and packaging has since been revised to have BNG provide a process system and equipment but with FHI direct involvement in formal reviews throughout development and fabrication. FHI will provide the nuclear safety function for BNG and will install the equipment, prepare the operating procedures, train the operating personnel, and operate the system throughout the sludge stabilization campaign. After acceptance of the BNG provided equipment, BNG will provide technical support to FHI during operation. This approach puts FHI engineering and support organizations in a direct, integrated role during the development of the process. Using this approach simplifies the management of the project and more readily aligns with existing FHI project management processes.

Definition of Bulk Sludge and Containerized Sludge

New terminology is being introduced to clarify commitments being made to the DNFSB. The majority of the sludge, or "bulk sludge," in the K-East and K-West Basins will be consolidated into engineered containers within each basin using the SCS. The SCS consists of a water cleaning system, a combination of pumping systems, and an eductor pumping system. Bulk sludge is being consolidated into engineered containers to ensure that no spent nuclear fuel remains in the basins and for defense-in-depth purposes to mitigate the potential release of sludge to the environment under certain accident conditions. Bulk sludge containerization means that a first pass with a vacuum has been completed to remove large amounts of sludge; racks, and debris have been removed from the area; additional vacuuming has been completed, as necessary, to expose the

concrete surface of the basin; and debris has been washed to remove visible surface sludge. The vacuumed sludge will be collected and consolidated into a number of containers in each basin. Bulk sludge does not include material in the Knock-Out Pots or in the settler tanks.

Containerized sludge consists of bulk sludge that has been consolidated in the engineered containers, sludge in the Knock-Out Pots, and sludge in the Settler Tanks. Containerized sludge will undergo treatment and repackaging for appropriate disposal. After bulk sludge is consolidated into the engineered containers, and removed from the basin, the quantity of any residual sludge that remains in combination with other nuclear hazards of the facility (e.g., sand filter media, spent cartridge filters, residual scrap Spent Nuclear Fuel) will not be significant to the extent that the basin will be able to be reclassified from a Hazard Category II facility to less than a Hazard Category III facility.

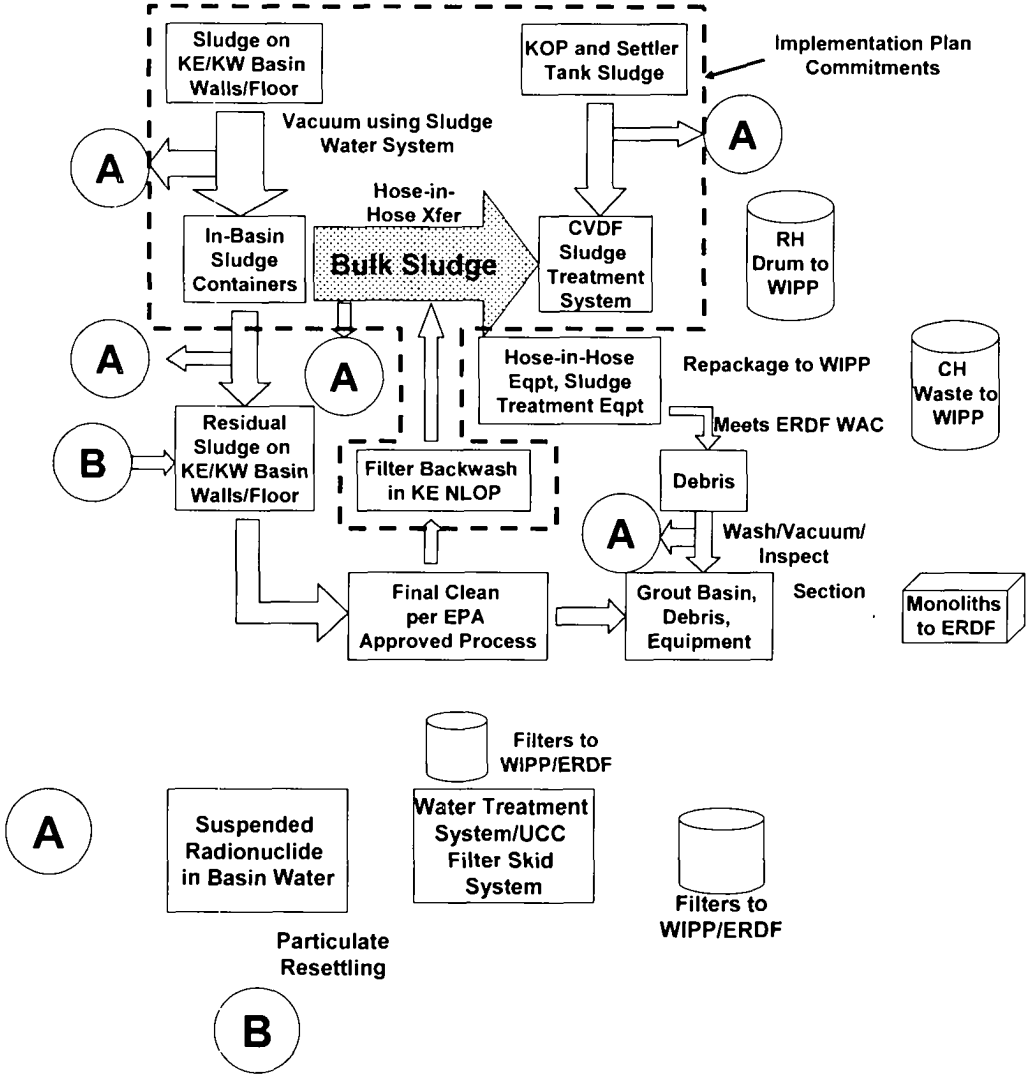
The remaining sludge, along with the basin structure and water, will be dispositioned under plans approved by the U.S. Environmental Protection Agency (EPA) and existing site-wide waste stream disposal processes and practices. The plans specify the necessary steps to achieve the "endpoint" criteria for sludge, as well as debris and found fuel. Achieving this endpoint will allow disposal of the basin and debris, once grouted, at the Environmental Restoration Disposal Facility (ERDF).

The plan requires that the final sludge removal process be qualified through testing prior to use. The equipment has not yet been designed, but the overall technical approach will consist of a vacuum system with a fine filter to capture the sludge. The filters are planned to be packaged for disposal, pending certification, at the Waste Isolation Pilot Plant (WIPP) or ERDF through exiting site programs. The filters will be drained and absorbent added. Depending on the amount of resettling and efficiency of the bulk sludge vacuuming, some of the remaining sludge in the K East Basin may be collected in the filters and back-flushed into the K East North Load Out Pit (NLOP). Any sludge that has been back-flushed from the filters into the K East NLOP will be transferred to the engineered containers in the K West Basin. The back-flushing of the filters may be done to minimize waste generation and to assist in K East Basin decontamination and decommissioning schedules.

Similar filters from the Water Treatment System have already been repackaged for disposal at WIPP pending certification. Packaging of all Transuranic (TRU) waste is done in collaboration with the TRU Waste Program. The program is well established, has been certified by WIPP and the EPA, and there are no anticipated problems with certification of sludge loaded filters to WIPP.

Once the final sludge removal process is complete, a measurement of the amount of sludge remaining is required. The targeted thickness of sludge remaining is 0.05 inch or less including resettled sludge. This thickness collectively corresponds to approximately one cubic meter of sludge on the basin floor. A maximum thickness of 0.1 inch may be allowable depending on other sources of sludge (sludge entrained in the concrete, sludge on the debris, etc). This is based on an assumption that the sludge is made up of 80 percent floor sludge and 20 percent canister sludge, which is a conservative assumption. The sludge thickness will be physically measured by an optical device using a process approved by the EPA. All sources of sludge are considered to ensure the grouted basin will meet the ERDF Waste Acceptance Criteria (WAC). Figure 1 illustrates bulk sludge and the disposition paths of the sludge in the K-Basins.

Figure 1: Flow Path of Sludge Processing/Disposal Path



K-East North Load Out Pit (NLOP) Update

The K-East NLOP contained approximately 6.3 cubic meters of sludge. A total of approximately 3.5 cubic meters has been transferred to T Plant for grouting. No more sludge is planned to be shipped to T Plant. The remaining sludge will be consolidated with the other K-East sludge.

Commitment Date Change Basis

Hazard Elimination

As a normal requirement for managing wastes at the Hanford Site, proposed disposition paths for all waste streams were evaluated and confirmed. This ensures that a path did not create an "orphan" waste stream. Table 1 identifies the different basin materials, the general form of the hazard it presents, the treatment process to be used, and its waste disposal path. This IP change addresses the hazard elimination path for the first four basin materials shown in Table 1. Other basin materials will be dispositioned through existing site programs.

Table 1 – Comprehensive Hazard Elimination Approach

Material Type & Quantity	Hazards	Treatment Process	Waste Forms	Disposal Path
Floor & Pit Sludge (all pieces < 0.25") ~59,000 kg (wet)	Highly dispersible in current form, High radiation exposure	Stabilize with high temp/press process & grout into 55 gal drums	RH TRU	WIPP
Settler Tubes and Knock-Out Pot Sludge (all pieces < 0.25") ~13,000 kg (wet)	Highly dispersible in current form, High radiation exposure, Criticality possible	Stabilize with high temp/press process & grout into 55 gal drums	RH TRU	WIPP
KE Basin NLOP Sludge ~8,800 kg (wet)	Dispersible in current form	Grout into 55 gal drums	CH TRU or Meet ERDF WAC	WIPP or Hanford ERDF
Fuel Pieces (all pieces (> 0.25")	Highly radioactive	Dry fuel & store in CSB	Pack in MCO	Yucca Mtn
Contaminated Hose-in-Hose equipment (4 Booster stations and hose)	Dispersible in current form, High radiation exposure possible	Flush, drain, repack to WIPP or grout in basin	CH /RH TRU or Meet ERDF WAC	WIPP or Hanford ERDF
Contaminated Sludge Treatment equipment	Dispersible in current form, High radiation exposure possible	Flush, drain, repack to WIPP or grout in basin	CH /RH TRU or Meet ERDF WAC	WIPP or Hanford ERDF

Suspended particles in Basin ~ 250 kg (wet)	Contamination hazard, dispersible if dried	Wait for settling, Clean /Filter with Qualified Process, Pack filters into 55 gal drums	CH TRU	WIPP
Basin Debris	Dispersible in current form	Repackage to ERDF/Grout in Basin	Meet ERDF WAC	ERDF
Basin	Dispersible in current form	Grout and section for ERDF disposal	Meet ERDF WAC	ERDF
Basin Water	Contamination hazard	Treat through Effluent Treatment Facility	Meet ERDF WAC	ERDF

Risk Assessment

A modified July 22, 2005, K-Basin working schedule was used as the basis for the risk assessment. The modifications incorporated durations for risks that had been identified as almost certain to occur and also reflected the sludge consolidation strategy of interference removal prior to vacuuming. The working schedule activities were then "rolled up" into a higher level risk schedule and were used during the risk assessment process. The risk assessment process consists of four main steps: identification, analysis, response, and management. Brainstorming sessions are held with key project team members to identify the risks associated with each activity. Once the risks are identified, the likelihood of occurrence (in five discrete bins) and the potential consequences of the unmitigated risks are assessed. These potential consequences are quantified in days as best, most likely, and worst case impacts to the project schedule. These numbers are then used in a Monte Carlo analysis to correlate schedule dates with confidence level of achieving the date. The Monte Carlo technique is recognized by both DOE Order 413.3-1, Chapter 14; and the Project Management Institute's Guide to the Project Management Body of Knowledge (PMBOK Guide). This technique uses a statistical sampling method to "select" combinations of risk likelihood and "best," "most likely," and "worst" case consequences, applied randomly, over a number of iterations (typically 2,000). For the K-Basins application, a "Latin Hypercube" technique was applied; since it is a more stratified, generally more efficient sampling technique that better captures the effects of the "tails" of the input probability distributions. The combination of the likelihood and the potential consequences also identifies the risks with the largest schedule impacts. A mitigation strategy is then developed for each high-risk item. The mitigation strategy outlines actions to mitigate the risk, estimates the cost of implementing the mitigation, assigns responsible personnel, and assigns a due date. The mitigation strategy also notes expected changes to the likelihood of occurrence and/or the potential consequences of the risks. Monte Carlo analysis then quantifies the impact to the schedule assuming the mitigation strategy is

implemented. Risk matrices document the outcome of the risk assessment process and become a management tool that can be assessed by project management, reported against and updated regularly.

Major Assumptions

The KBC Project was divided into subprojects. The major assumptions under the subprojects are listed below:

K-East Bulk Sludge Containerization

1. Qualified Process Document (KBC-24721) currently drafted by FHI will be approved by EPA and DOE without significant changes.
2. As described in Qualified Process Document (KBC-24721), a maximum of 14 work days is adequate to allow for water clarity to allow the measuring of sludge re-deposition to demonstrate meeting endpoint criteria.
3. The ERDF or Central Waste Complex (CWC) acceptance criteria HNF-EP-0063 does not significantly change.
4. Rate and material costs assume the basin will be an Airborne Radioactivity Area for the remainder of K-East containerization.
5. Less than 25 percent of debris removed from basin requires grouting for dose reduction before disposal at ERDF; the remaining 75 percent does not require grouting (based on sludge containerization experience to date).
6. Reductions in force on the Hanford Site do not significantly impact skills mix/qualifications for K-East containerization.

K-East/K-West Transfer

1. No more than 50 cubic meters of sludge will be transferred from K-East Basin (Volume estimate per SNF-7765, "Supporting Basis for SNF Program Technical Data Book").
2. Less than one-third of the K-East Basin will require a post-transfer final pass vacuuming for re-deposited sludge. Based on K-East final pass duration estimate of 60 days, this can be completed to meet Endpoint Criteria in 20 days, and utilizes up to 400 filters.
3. No major system redesign or new engineering systems will be required to complete sludge transfer and post-transfer vacuuming.
4. Reductions in force on the Hanford Site do not significantly impact skills. mix/qualifications for K-East to K-West Transfer system.

K-West Bulk Sludge Containerization

1. Qualified Process Document (KBC-24721) currently drafted by FHI will be approved by EPA and DOE without significant changes.
2. As described in Qualified Process Document (KBC-24721), a maximum of 14 work days is adequate to allow for water clarity to allow the measuring of sludge re-deposition to demonstrate meeting endpoint criteria.
3. K-West floor and pit sludge volume is not more than the estimated 4.7 cubic meters.
4. The duration of 135 working days for completion of floor and pit sludge containerization is based on the ability of the floor and pit sludge retrieval system to vacuum in and around the fuel retrieval system, multi-canister overpack (MCO) loading system/cask loading system,

and fuel transfer system components that cannot be moved or disassembled. Vacuum durations based on time and motion study (HNF-22078, RPT-0105455-EG-00005) and lessons learned from K East vacuuming.

5. The ERDF or Central Waste Complex (CWC) acceptance criteria HNF-EP-0063 does not significantly change.
6. Qualified process applied at K-East will be replicated at K-West.
7. Rates and material costs assume an Airborne Radioactivity Area will be required for K-West sludge containerization.
8. Less than 25 percent of debris removed from basin requires grouting for dose reduction before disposal at ERDF; the remaining 75 percent does not require grouting (based on K-West sludge consolidation experience to date).
9. Reductions in force on the Hanford Site do not significantly impact skills mix/qualifications for K-West containerization.

Balance of Sludge Treatment

1. The actual amount of sludge requiring treatment is less than the nominal values for sludge quantities contained in SNF-7765.
2. Existing CVDF seismic criteria analysis and design based upon HNF-PRO-097 will not change. The current performance category designation at the CVDF will not change.
3. The sludge treatment system design and processing rate that reflects the selected technical path of oxidation in hot water (185°C) under pressure (225 psig; 16.3 atm) does not change.
4. The Sludge Treatment Project schedule accommodates the processing of three MCOs for found fuel processing. Additional MCOs will cause schedule delays for the Sludge Treatment Project.
5. No more than 1,350 drums of waste will be generated from sludge processing. Container sludge will generate 405 drums (volume limited); settler sludge will generate 311 drums (fissile gram equivalent limited); Knock-Out Pot sludge will generate 504 drums (hydrogen generation limited); 130 drums allocated to system cleanout, testing, failed drums, etc.
6. Post Comprehensive Environmental Response, Compensation, and Liability Act Record of Decision Treatability studies and Focused Feasibility Study will not result in a change to the planned treatment process.
7. Up to two-thirds of the K-West Basin will require a post-transfer final pass vacuuming for re-deposited sludge. Based on K-West final pass duration estimate of 60 days, this can be completed to meet Endpoint Criteria in 20 days, and utilizes up to 400 filters.
8. Reductions in force on the Hanford Site do not significantly impact skills mix/qualifications for Balance of Sludge Treatment.

Results

As a result of the 30-day delayed start resulting from the completion of spent fuel, experience gained from containerizing actual sludge and risk analysis, containerization of the K-East sludge is now estimated to take 23 months and is scheduled to be complete by October 2006.

Applying the lessons learned from K-East sludge containerization, accounting for efficiencies, and adjusting for risks, K-West sludge containerization is anticipated to be complete by July 2007.

Delays in containerization of K-East sludge have had a direct impact on the ability to complete installation, testing, and startup of the HIH transfer system. The HIH sludge transfer system was conceptually based on similar transfer designs used to transfer tank waste at Hanford's tank farms. Although the concept of an HIH transfer system was sound, designing a system to transfer K-Basins sludge slurry with such unique characteristics required substantial changes during design and fabrication, which in turn resulted in a 12-month delay from the original schedule. As a result of the delays and adjustment for risks, the transfer of sludge from K-East to K-West is anticipated to be complete by May 2007.

Although the sludge treatment method was selected as originally committed and a contract was issued in November 2004, the sludge treatment contract scope required modifications to better define project controls and to assure proper flow down of safety requirements. Resources were also diverted to other portions of the project during this time period resulting in further delays in the completion of design documents. This has resulted in about a 12-month delay from the original schedule. As a result of these delays and adjustment for risks, completion of sludge treatment is anticipated to be completed by November 2009. The interim commitment of processing 20 cubic meters of sludge has been revised to processing the first 50 drums. Sufficient operational proficiency should be gained after processing this quantity of drums.

Mitigative Actions for Major Project Risks

Table 2 lists the major risks identified during the risk assessment, the mitigating actions being taken, and the duration added to the schedule.

Table 2 – Major Risk, Mitigating Action, and Duration Added to Schedule to Accommodate Risk

Major Risk	Mitigating Action	Duration Added to Schedule to Accommodate Risk (Days)*
K- East Containerization		
Equipment failure delays rack removal	Perform preventative maintenance on equipment	74
Basin water clarity problems decrease productivity	Sequence debris removal and sludge disturbing work and procuring additional Ion Exchange Module	
K-East to K-West Transfer of Containerized Sludge		
Equipment failure during transfer operations	Identify spare part, future procurements	249
Integrated acceptance test identifies problems that require rework	Perform qualification testing, visual testing, and integrated clean water testing	

K-West Containerization		
Basin water clarity problems decrease productivity	Sequence debris removal and sludge disturbing work and procuring additional Ion Exchange Module	62
During K-East to K-West transfer, sludge will be re-deposited on basin floor requiring rework	Future mitigation, no credit taken at this time	
Containerized Sludge Removal and Treatment		
Existing technical basis is not sufficient to prove corrosion	Future mitigation, no credit taken at this time	282
Existing HIH equipment will not work for containerized sludge removal and treatment due to higher solid content	Future mitigation, no credit taken at this time	
Unexpected process phenomena results in process delays/upsets	Future mitigation, no credit taken at this time	

*The duration specified accommodates all risk for the subproject, not just the major risks.

2000-1 IP Changes

1. Under the Hanford section of Remaining Actions under Recommendation 2000-1 section in the Executive Summary and Section 1.3 – Future Plans and Milestones, revise the dates associated with the following spent fuel and sludge commitments:

   - K-East bulk sludge will be containerized by October 2006,
   - If required, sludge back-flushed from the filters will be transferred to K-West Basin by May 2007,
   - Containerized sludge will be removed from K-East Basin and transferred to K-West Basin by May 2007,
   - Bulk sludge in K-West Basin will be containerized by July 2007, and
   - Containerized sludge will be removed and packaged for disposal from K-West Basin by November 2009.

2. Under the Hanford section of Overview of Site Progress Since Previous Revision of Section 4.1, add the following completed actions:

   - All spent nuclear fuel stored in racks has been removed from the K-Basins, and
   - A treatment methodology for containerized sludge has been selected.

3. Rename the Spent Nuclear Fuel title in section 5.1 to K-Basin Materials Disposition. Replace the K-East North Load Out Pit (NLOP) Processing Path of the K- Basins Materials Disposition writeup in section 5.1 with:

   Some of the sludge from the K-East NLOP will be grouted to meet Contact-Handled Transuranic (CH-TRU) waste acceptance criteria. Equipment to remove the K-East NLOP sludge is currently available and retrieval operations can be performed in parallel with fuel removal activities. Some of the sludge will be placed into large diameter containers and transported for treatment at T Plant. It is anticipated that some of the sludge may meet low level waste acceptance criteria after being treated through the grouting process. These low level wastes will be disposed of at the Environmental Restoration Disposal Facility (ERDF). The remainder of the K-East NLOP sludge will be transferred with other K-East sludge to the K-West Basin engineered containers.

4. Replace the last paragraph under the K-Basins Materials Disposition writeup in section 5.1 with:

   The majority of the sludge, or "bulk sludge," in K-East and K-West Basins will be consolidated into engineered containers within each basin using the Sludge Containerization System (SCS). The SCS consists of a water cleaning system, a combination of pumping systems, and an eductor pumping system. Bulk sludge is being consolidated into engineered containers to ensure that no spent nuclear fuel remains in the basins and for defense-in-depth purposes to mitigate the potential release of sludge to the environment under certain accident conditions. Bulk sludge containerization means that a first pass with a vacuum has been completed to remove large amounts of sludge; racks and debris have been removed from the

area; additional vacuuming has been completed, as necessary, to expose the concrete surface of the basin (to the extent practical); and debris has been washed to remove visible surface sludge. The bulk sludge will be collected and consolidated into a number of containers in each basin. Bulk sludge does not include material in the Knock-Out Pots or in the settler tanks.

Containerized sludge consists of sludge that has been consolidated in the engineered containers, Knock-Out Pots, and settler tanks. Containerized sludge will undergo treatment and repackaging for appropriate disposal. After bulk sludge containcrization, some amount of sludge is expected to remain in the basin.

The remaining sludge, along with the basin structure and water, will be dispositioned under a plan approved by the U.S. Environmental Protection Agency (EPA) and existing site-wide waste stream disposal processes and practices. Depending on the amount of resettling and efficiency of the bulk sludge vacuuming, some of the remaining sludge in the K East Basin may be collected and consolidated into the K East NLOP. Any sludge collected and consolidated into the K East NLOP will be transferred to the engineered containers in the K West Basin.

K-East bulk sludge containerization will be completed by October 2006. If additional sludge has been collected and consolidated into the K East NLOP, this sludge will be transferred to the containers in K West Basin by May 2007. K-West bulk sludge containerization will be completed by July 2007. Containerization of sludge will also aid in making subsequent sludge movement activities morc predictable. During containerization, any found spent nuclear fuel and uranium metal entrained in the sludge that is greater than 0.25 inch is removed and processed as fuel scrap through the Cold Vacuum Drying Facility (CVDF). The K-East containerized bulk sludge will then be transferred via piping and consolidated with the sludge in K-West by May 2007 to allow for dewatering and removal of the K-East Basin structure. Sludge remaining in the K-East containers after transfer is complete will be dispositioned under a plan approved by the EPA.

Sludge transfer supports the project objective to remove the K-East Basin as soon as possible to allow remediation of the soil beneath the basin. This soil remediation is included as a remedy in the Hanford 100 Area Remaining Site Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Record of Decision and is viewed as a high priority by DOE, the EPA, and other Hanford stakeholders. The removal of sufficient sludge from K-East allows the basin structure to be disposed of in the ERDF at Hanford.

Regarding sludge treatment, a contract was issued for designing, constructing, and operating the sludge treatment system in November 2004. The sludge treatment contract scope has been modified to better define project controls, to implement recommendations from the SRB, and to assure proper flow down of safety requirements. A sludge treatment risk mitigation plan will be prepared, issued, and implemented once the treatment system design is finalized. If appropriate, the commitment dates for treatment and packaging the containerized sludge will be adjusted through a change to the Implementation Plan. It is expected that sludge treatment design will be completed by October 2006. The bulk sludge

and sludge from the Knock-Out Pots and settler tanks will be transferred via piping to the sludge treatment system located in the CVDF using the same system as was used to transfer sludge from K-East to K-West Basin. The sludge treatment system will be capable of treating and packaging bulk sludge and sludge retrieved from the Knock-Out Pots and settler tanks. Treatment and packaging of the first 50 drums will be completed by December 2008. Treatment and packaging of containerized sludge will be completed by November 2009. Sludge remaining in the transfer and processing equipment will be dispositioned under a plan approved by the EPA.

5. Revise the dates associated with the following commitments under the K-Basins Materials Disposition commitments at the end of Section 5.1:

Commitment Statement:	Complete bulk sludge containerization of the K-East Basin
Responsibility:	Manager, Richland Operations Office
Applicable Facilities:	K-East Basin, Cold Vacuum Drying Facility
Commitment Deliverable:	K-East Basin bulk sludge containerized
Due Date:	October 2006

Commitment Statement	If required, complete transferring sludge in the K-East North Load Out Pit (as a result of back-flushing filters) to engineered containers within the K-West Basin
Responsibility:	Manager, Richland Operations Office
Applicable Facilities:	K-East Basin, K-West Basin
Commitment Deliverable:	Back-flushed filter sludge in the K-East North Load Out Pit removed
Due Date:	May 2007

Commitment Statement:	Complete transfer of containerized sludge from the K-East Basin to engineered containers within the K-West Basin
Responsibility:	Manager, Richland Operations Office
Applicable Facilities:	K-East Basin, K-West Basin
Commitment Deliverable:	Sludge from K-East Basin containers removed
Due Date:	May 2007

Commitment Statement:	Complete bulk sludge containerization of the K-West Basin
Responsibility:	Manager, Richland Operations Office
Applicable Facilities:	K-West Basin, Cold Vacuum Drying Facility
Commitment Deliverable:	K-West Basin bulk sludge containerized
Due Date:	July 2007

Commitment Statement:	Containerized sludge in the K-West Basin will be removed and treated to meet the applicable waste acceptance criteria
Responsibility:	Manager, Richland Operations Office
Applicable Facilities:	K-West Basin, Cold Vacuum Drying Facility
Commitment Deliverable:	Containerized sludge removed from the K-West Basin and packaged to the draft WIPP RH-TRU criteria. Containerized sludge is sludge from the engineered containers in K-West, the Knock-Out Pots, and the settler tanks.
Due Date:	November 2009

6. Add the following to Appendix C references:

   U.S. Department of Energy letter from Spencer Abraham to John T. Conway, dated May 3, 2004, transmitting the revised IP concerning sludge removal at the K-Basins.

   Defense Nuclear Facilities Safety Board letter from John T. Conway to Paul M. Golan, dated February 4, 2005, establishing a 60-day reporting requirement regarding Sludge Retrieval and Disposition Project.

   U.S. Department of Energy Environmental Management Sludge Review Board Report on K-Basin Sludge Retrieval and Disposition Project at Hanford Site, dated May 26, 2005.

   Fluor Hanford, Inc. letter from R. G. Gallagher to K. A. Klein, dated August 16, 2005, specifying response to first four recommendations of the Sludge Review Board Report.

7. Revise the following IP Commitment Numbers of Appendix D and add footnotes:

Commitment Statement:	Complete bulk sludge containerization of K-East Basin sludge
IP Commitment Number:	119E
Due Date:	October 2006[23]
Commitment Statement:	If required, complete removal of filter back-flush sludge from K-East North Load Out Pit
IP Commitment Number:	122E
Due Date:	May 2007
Commitment Statement:	Complete removal of containerized sludge from K-East
IP Commitment Number:	120E
Due Date:	May 2007[24]
Commitment Statement:	Complete bulk sludge containerization of K-West Basin sludge
IP Commitment Number:	119W
Due Date:	July 2007[25]

Commitment Statement: Complete removal and packaging of containerized sludge
IP Commitment Number: 120W
Due Date: November 2009[26]

[23]Previous revision due date: December 2004
[24]Previous revision due date: July 2005
[25]Previous revision due date: February 2006
[26]Original revision due date: August 2004

8. Add the following under Hanford SNF in Appendix F.

Selected a treatment method for containerized sludge in K-Basin, November 2004
Completed fuel removal, October 2004
Completed grouting of the K-East discharge chute, October 2004
Started containerization of K-East sludge, October 2004
Completed shipments of K-East NLOP sludge in large diameter containers to T Plant, September 2005