



Department of Energy

Washington, DC 20585

JUN 4 1998

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, N.W.
Suite 700
Washington, D.C. 20004

Dear Mr. Chairman:

Enclosed is a revised Integrated Program Plan (IPP) for Recommendation 94-3. The Recommendation addressed safety improvements for Rocky Flats Building 371, which will store the site's plutonium pending shipment for disposition. This revision to the IPP integrates plans for enhancing the safety of interim storage of Rocky Flats' plutonium with plans for accelerated site closure. It is responsive to your letter of October 15, 1997, on this subject.

Changes in this revision include delay in completing the Safety Margin Upgrades from 1999 to a date no later than 2002. The delay will permit orderly validation and design of these upgrades. Provision is made for suspending implementation of Safety Margin Upgrades if specific milestones are met for accelerated shipment of nuclear materials from Rocky Flats. Plans for preparation of the site's nuclear materials for long term safe storage and disposition elsewhere are addressed to reflect the interdependency of those plans.

The approval of this revision to the IPP has been delayed beyond the expectation of our letter of November 10, 1997, to accommodate the interests of your staff and various Department organizations who are party to the integrated plans and commitments for accelerated closure of Rocky Flats. The Secretary has formed a Rocky Flats Closure Team chaired by the Deputy Secretary. Patrice Bubar, of my staff, is responsible for coordinating the headquarters resolution of critical path uncertainties for Rocky Flats closure plans. I encourage you or your staff to discuss the integration of site external milestones addressed in this plan with me or with Patty (301-903-7130).

Sincerely,

A handwritten signature in black ink that reads "James M. Owendoff".

James M. Owendoff
Acting Assistant Secretary for
Environmental Management

Enclosure

cc: Mark Whitaker, S-3.1



Printed with soy ink on recycled paper

U. S. Department of Energy

**Defense Nuclear Facilities Safety Board
Recommendation 94-3**

INTEGRATED PROGRAM PLAN

April 28, 1998

Revision 1

Reviewed for
Classification/UCNI by

R. R. RIDDLE

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EXECUTIVE SUMMARY

An evolution of the Department of Energy's (the Department) "interim storage" plans (2002-2015) for ensuring safe storage of surplus fissile material currently located at the Rocky Flats Environmental Technology Site (Rocky Flats, RFETS or the Site) has required a revision to this Integrated Program Plan (IPP). The updated executive summary is provided in two parts. The first part (below) includes program changes and provides both the basis for and the scope of this IPP revision. The second portion (Appendix A) is taken from the initial IPP in order to provide background for the Department's activities responding to the original Defense Nuclear Facilities Safety Board (Board) recommendation, as well as to emphasize that the goals set out in the original IPP have not been changed. The objectives of those goals that will be referred to often in this revised IPP are:

- *Provide an updated Building 371 Authorization Basis (AB), complete definition and implementation of necessary safety upgrades in Building 371, and establish building operations in conformance with the updated AB (Section 3); and*
- *Prepare Building 371 for safe interim storage of the Site's plutonium metal and oxide by 2002 or provide an acceptable alternative (Sections 5 and 6).*

EXECUTIVE SUMMARY (REVISION 1)

The Board accepted [38] the IPP as originally submitted [39] and the Department and its contractors proceeded with implementation. Developments during implementation, including the Department's evolving commitment to accelerated closure of the RFETS, led the Board to request a revision [40], which the Department agreed to provide [41]. This Executive Summary is provided to summarize the current implementation status and to describe the purpose and scope of Revision 1.

Initial efforts to develop the updated Authorization Basis (AB) for Building 371 fell behind schedule, leading to a restructuring of the AB development team, and an allotment of additional resources. The final document (the Building 371/374 Complex Basis for Interim Operations [BIO]) was issued on September 10, 1997 [42], together with the Department's review and approval document [43]. On the same date, the Authorization Agreement for Building 371 [44], based on the approved BIO, was issued. In addition, the Implementation Plan for the BIO (BIO-IP) [45] was written to ensure, through phased implementation, that the BIO becomes the AB of record for all Building 371/374 Complex activities by August 1, 1998. This date is substantially later than the December 1996 commitment for milestone 3-3 included in the original IPP, however, the BIO is more robust than the simple, conservative document that the original IPP envisioned. In light of insights gained from the BIO development, the existing authorization controls have been reviewed and measures implemented to ensure continued facility safety, pending complete implementation of the new Technical Safety Requirements (TSR) (e.g., an Operation Order requires that high Pu content drums be attended on the dock).

Efforts to implement the Priority Safety upgrades in Building 371 also fell behind schedule after initial success with the repair of the T-line joint. An assessment conducted by Rocky Flats Field Office (RFFO) in March 1997 identified shortcomings with the engineering and management of the upgrades. This led to a restructuring of the contractor's 94-3 program management. The restructured organization provides a senior level program manager reporting directly to a single responsible vice-president. The new program manager is assigned the necessary resources for effective program performance. With these changes, substantial progress has been made. Eleven of the fifteen priority upgrades were completed as scheduled (IPP milestone 3-2 called for implementation of all Priority upgrades by December 1997). The remaining four are being completed in 1998, along with the twenty-one additional upgrades identified to support the implementation of the BIO.

As committed to in the original IPP, the evaluation and selection of material management alternatives to address the risk from highly dispersible residues was completed on schedule (milestones 4-1 and 4-2). The

selected strategy utilizes Pipe Overpack Containers (POCs) for Board Recommendation 94-1 packaging of most residues. This packaging has been shown to provide Type B equivalent protection for the package contents.

The Record of Decision for the Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement (PEIS), issued in January 1997, decided on off-site shipment of Rocky Flats Special Nuclear Material (SNM) on a schedule that would obviate the need for an Interim Storage Vault (ISV) at Rocky Flats. As a result, the Department suspended all work beyond the conceptual design of an ISV. Therefore, reference to the ISV as the preferred option for interim storage has been deleted from this IPP. Based on the Department's decision, off-site shipments of plutonium in pit form are underway and will be completed by FY99. This IPP contains the schedule leading to shipment of non-pit material from Rocky Flats (Section 5).

Based on the Department's off-site shipment decision, this revision to the IPP differentiates the near-term mission of Building 371, which is to prepare materials for, and complete, off-site shipment, and the potential "interim storage" mission, which would involve extended storage onsite in Building 371 should off-site shipment not take place as planned. The near term mission extends through 2004 based on the 2002 committed date for material stabilization and packaging with an additional two-years allowed to complete off-site shipments. If off-site shipments are delayed, the interim storage mission will begin in 2002 and extend until shipments are finally completed, a date estimated to be no later than 2015 as agreed to in the Rocky Flats Cleanup Agreement [51].

The major objective of Revision 1 is to define actions and responsibilities that will ensure the Department's off-site shipment decision is realized, or, if not realized, that Building 371 is ready to begin an interim storage mission by 2002. This IPP commits to a firm baseline plan by which the Department will ensure timely off-site shipment (Section 5). In parallel, the Department will proceed to ensure that Building 371 is prepared for interim storage (Section 6). Only when the Department demonstrates that factors necessary for shipment have been resolved and that the baseline plan of off-site shipment can be executed as scheduled will efforts to prepare Building 371 for interim storage be suspended. The revised IPP is structured as follows:

1. Section 1 lays out the structure of the organization that will execute the IPP, delineating responsibilities from the Assistant Secretary for Environmental Management at DOE/HQ to the RFETS contractor support.
2. Section 2 details the actions the Department has taken to address the eight sub-recommendations of Recommendation 94-3.

A plan for an updated AB and its basis is provided in a revised completion status for Board sub-recommendation 2. The original IPP committed to develop an initial, conservative AB in Basis for Interim Operations form and a final AB in Safety Analysis Report (SAR) form to support the near-term missions (through 2002) of Building 371. Given the rigor of the BIO, the Department no longer plans a revision in SAR format for the near-term Building 371 mission. The bases for this conclusion include:

- The Safety Management Programs required by the BIO are consistent with DOE Standard 3009, and have been supplemented with Integrated Safety Management and Activity Control.
- The BIO affords a robust set of accident scenarios, made even more complete by separate evaluation of the hypothesized failure of each of the credited controls and of those combinations of credited controls judged to result in credible failure sequences. The resulting scenario set is sufficiently comprehensive to satisfy the requirements of DOE Standard 3009 for SAR accident analyses.
- The system descriptions in the BIO, the functional requirements in the new TSRs, and the explicit system and component requirements in the supporting system design documents ensure that identified safety systems will be maintained capable of performing their credited safety functions.

- The principal difference between the completed document and an appropriately graded SAR involves the qualitative estimates of scenario frequencies in the BIO. These judgments were made conservatively, however, drawing upon Site experience with earlier more quantitative estimates. The resulting control set is not adversely affected by the frequency approximations.
- The rebaselining of the hazard and accident analyses are judged to be consistent with the graded requirements of DOE Order 5480.23, the current storage mission, and planned risk reduction activities through 2002.
- Considering the above, an upgrade of the BIO to a SAR equivalent form for the near-term mission of B371 would not be expected to impact the control set (TSRs).
- If the interim storage mission (i.e. storage of oxides and metals through ~2015) reverts to Building 371, the AB for the facility will be revised to, or replaced with, one in a SAR form compliant with DOE Order 5480.23 to support the extended mission and the few post-stabilization nuclear activities which may accompany it. Section 6 provides the contingency plan to develop a SAR for interim storage (2002-2015).

The Board, in its recent letter [40], noted that three of the scenarios analyzed in the BIO do not meet the established public risk guideline. For these scenarios, additional effective controls are being investigated and will be incorporated in the first annual update to the BIO (September 1998). The specific scenarios are noted below and the planned scope of investigation are discussed in Section 2, sub-recommendation 6.

- Large Dock Fire in the Support Facility (5.9 rem for BIO Support Facility Fire 2, Case B residues, unlikely).
 - Hydrogen Explosion in a Drum in Support Facility (31 rem for BIO Support Facility Explosion 1, Case D 3000 g residue drum, extremely unlikely).
 - 2000-yr Earthquake (8.6 rem for BIO 371/374 NPH 2, unlikely).
3. Section 3 details the actions taken by the Department to ensure the near-term mission of Building 371 (through 2002) is conducted safely, including the implementation of both the remaining Priority and BIO-driven upgrades, as well as the BIO itself.
 4. Section 4 addresses how risk from dispersible residues will be eliminated. Included is a discussion of how these activities are coordinated with Recommendation 94-1 activities to package these dispersible residues in the Pipe Overpack Container, a Type-B equivalent packaging container that provides substantial protection.
 5. Section 5 provides the Department's baseline plan to remove SNM from Rocky Flats, as well as the responsibilities throughout the Department of Energy complex required for this baseline execution. Specific milestones are presented to show progress toward SNM removal from the RFETS.
 6. Section 6 provides the plan to upgrade Building 371 and develop a SAR for interim storage. This project will be pursued in parallel with off-site shipment until the Department demonstrates that the baseline off-site shipment plan can be executed as scheduled. Specific criteria are listed that must be met before the RFETS can stop work on these Interim Storage upgrades and the SAR.

The plan to prepare Building 371 for interim storage in this revised IPP differs from the earlier plan in the timing for completion of upgrades, particularly those designated as "Safety Margin" upgrades in the original IPP. The Department is proposing that completion of the Safety Margin upgrades identified in the original IPP be delayed from 1999 to a date no later than 2002. This change has been given careful consideration by the Department and reflects the following judgments:

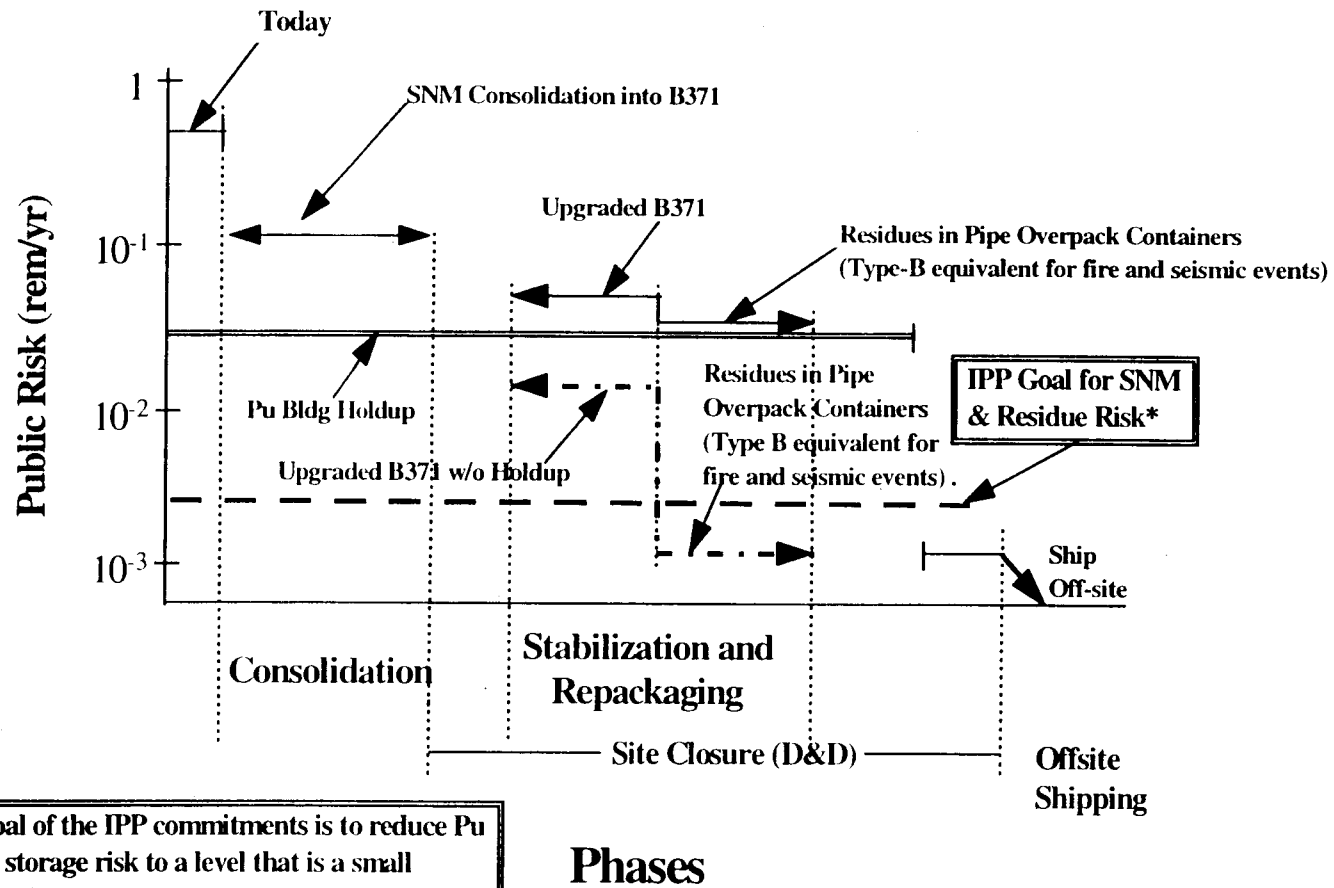
- Appropriate progress on Building 371 material storage risk reduction is being made in FY98 with: completion of the Priority upgrades, design and construction of the twenty-one BIO-identified upgrades, implementation of the new TSRs, preparation for material stabilization and packaging, and

the validation of Interim Storage upgrades. Note that the 94-1 Program packaging for SNM and residues will provide a steady reduction in risk and increase in safety margin once packaging is underway. Plutonium metal and oxide will be packaged in DOE-STD-3013 compliant containers. Dispersible residues will be placed in POCs. These sturdy containers provide significant defense-in-depth toward the goal of preventing material release in earthquake or fire scenarios.

- In this IPP revision all of the upgrades needed for an extended Building 371 mission (listed as Safety Margin, Material Relocation, and Security in the original IPP) have been combined and are referred to as Interim Storage upgrades. This allows all work necessary to prepare Building 371 for an interim storage mission to be integrated and prioritized to ensure Goal 2 of the IPP is met.
- The Board suggested [40] that engineering on the Safety Margin upgrades begin in FY98. Recent experience with the Priority upgrade implementation has shown that the original upgrade concepts were not sufficiently firm to proceed directly with detailed design. Further, many developments from the BIO and Site closure planning efforts impact the original concepts. Thus, the Department has planned to begin engineering in FY98 with a validation activity that will include selection of the appropriate Interim Storage upgrades, as well as completion of the pre-conceptual design for the upgrades chosen. There is substantial work to be done during the validation activity, and real progress will be made with its completion. The validation effort will be completed by August 1998.
- The validation in FY98 includes a sub-task to check whether any of the Interim Storage upgrades warrant priority implementation. Should an upgrade be determined to significantly enhance safety, then completion of the upgrade will be accelerated.
- The scope of the Interim Storage upgrades is expected to have decreased considerably from the \$43M total estimated in the original Recommendation 94-3 IPP. These reductions are due to ongoing pit shipments, decoupling of Security upgrades from those required for safety, and some expected reduction in the fire suppression upgrades in favor of combustible removal. The reduced scope requires a shorter construction schedule, enabling the Department to combine engineering design and to begin construction on all the Interim Storage upgrades validated at a later date than projected in the original IPP without deviating from the 2002 completion goal.
- Significant resources in FY99 will be allocated to perform engineering design for the validated upgrades. The completed design will serve as a detailed, comprehensive set of requirements necessary to schedule construction and the procurement of long lead materials. This will reduce the risk of obstacles and ensure timely completion of the project.
- The actual construction schedule, which will be developed as designs are completed, will be an integrated schedule that involves realistic estimates of productivity and sustainable levels of activity in Building 371 based on recent experience. The projects will be scheduled appropriately to ensure that they will be completed by 2002.

The Department's goal for Rocky Flats involves accelerated closure with an ambitious target of achieving closure by 2006. To achieve this goal, other sites in the complex must assume additional responsibilities, simplifying the stabilization, packaging and shipping missions at Rocky Flats which are now prerequisite to Site closure. The Department has undertaken an aggressive investigation of additional options that might support accelerated closure. The options currently being studied, or others that may emerge, could favorably impact the plans established in this IPP. Representative options are noted as contingencies in the various Sections. Quarterly reports will serve to inform the Board of developments on these acceleration options as they occur. Nevertheless, the baseline plan for off-site shipment and the plan to prepare Building 371 for interim storage in this IPP are commitments that the Department will meet or accelerate.

Figure 1
Site Strategies to Reduce Life Cycle Risk
(Dominated by Large Earthquakes)



*The goal of the IPP commitments is to reduce Pu interim storage risk to a level that is a small fraction of that from current Pu holdup.

INTRODUCTION

This IPP is divided into six sections to incorporate the goals and objectives stated in the original IPP's Executive Summary (Appendix A). Section 1 provides the program organization as well as addresses change control and the formal transmittal of the IPP deliverables to the Board. Section 2 demonstrates how the eight sub-recommendations contained in Recommendation 94-3 are addressed for Building 371. Section 3 addresses the activities necessary to update the Building 371 AB and to complete the Priority and BIO-driven upgrades which are being implemented to fulfill IPP Goal 1 (establish safe operation of Building 371 in conformance with an updated authorization basis). Section 4 includes the actions required to integrate the overall Site risk insights on residues with the actions being taken under Recommendation 94-1. The actions described in Section 4, together with either those in Section 5 or those in Section 6, will suffice to fulfill IPP Goal 2 (reduce the incremental Site risk from storage of SNM to a level that is a small fraction of the risk from plutonium holdup as of 1996). The Department's plan for implementation of off-site shipment of Site SNM to obviate interim storage onsite is described in Chapter 5. The plan to utilize Building 371, if necessary, for the interim storage mission is discussed in Section 6.

1. Program Organization

The Assistant Secretary for Environmental Management (EM-1) has the responsibility for maintaining the Recommendation 94-3 IPP and ensuring that commitments therein are met. EM-1 has line management responsibility for the execution of portions of this plan by Rocky Flats. EM-1 will coordinate with other Department headquarters managers those actions which are outside the control of the RFETS, but which substantially affect implementation of the plan to ship material off-site. That specifically includes the headquarters cross-program decisions, such as those which designate, fund and prepare other DOE complex facilities to receive materials shipped from Rocky Flats. The Program Office within Environmental Management that is responsible for coordinating these activities is the Office of the Deputy Assistant Secretary for Nuclear Material and Facility Stabilization (EM-60). Within EM-60, the Rocky Flats Office (EM-64) provides support on Rocky Flats specific issues. Other specific Department-wide responsibilities for actions planned to secure early off-site shipment of the Site's SNM are addressed separately in Chapter 5.

Technical assistance on both complex-wide and Site-specific task efforts will be provided by the Offices of Defense Programs, Environmental Safety & Health, Nonproliferation and National Security, and Fissile Materials Disposition.

The organizational structure to achieve the successful execution of those IPP activities centered at the RFETS is depicted in Figure 2. A brief description of responsibilities for these Site activities follows.

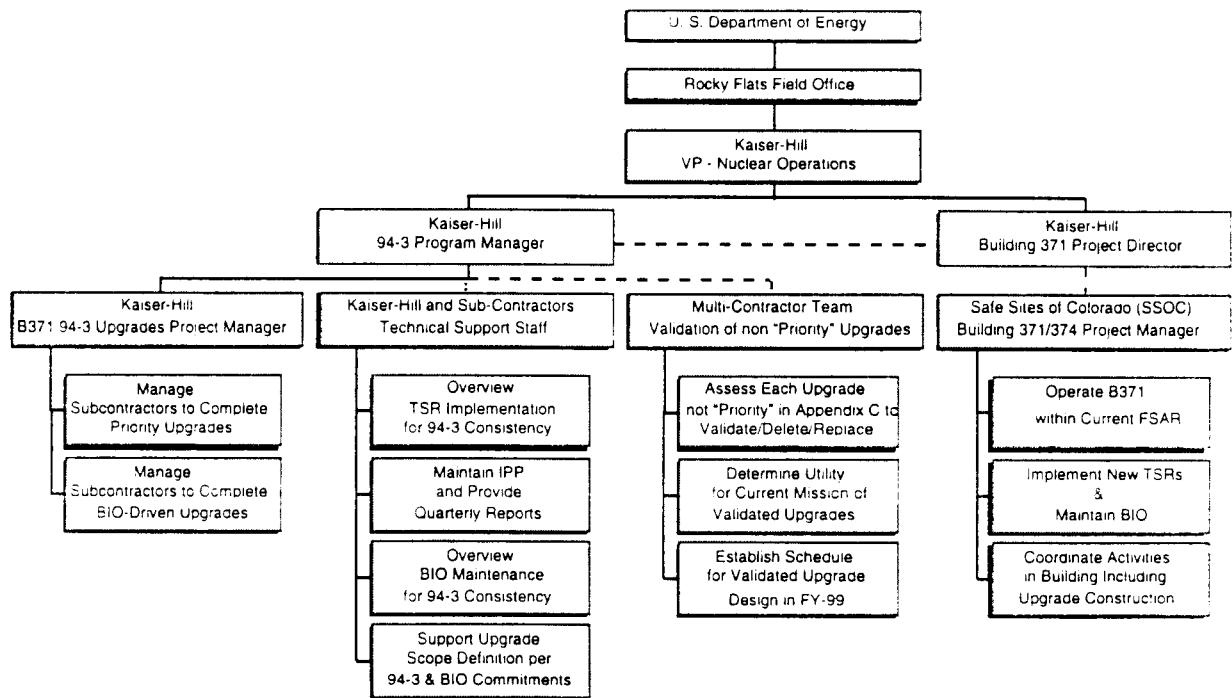
For the portions of the IPP that are under the control of the Rocky Flats Field Office (RFFO), the Deputy Manager for Technical Programs has the responsibility for providing technical direction to the contractor to ensure the successful execution of this IPP and for ensuring that Site risk-reduction activities are conducted on an appropriate priority basis. Within Technical Programs, the Assistant Manager for Material Stabilization & Disposition has the lead responsibility for ensuring and coordinating Department and contractor activities; the Assistant Manager for Engineering provides key technical support on upgrades and authorization basis.

The Kaiser-Hill (K-H) Vice President for Nuclear Operations has overall contractor responsibility for Recommendation 94-3 implementation and is accountable for ensuring successful execution of the IPP at Rocky Flats. The K-H 94-3 Program Manager reports to the Kaiser-Hill Vice President for Nuclear Operations and is responsible for program technical adequacy, cost, schedule and budget; the K-H 94-3 Program Manager provides programmatic and technical direction for the implementation of IPP activities. The K-H 94-3 Program Manager is the primary contact with RFFO on IPP implementation, ensures coordination of Recommendations 94-1 and 94-3 at Rocky Flats, and is the funding authority for the IPP. The K-H 94-3 Program Manager is responsible for integrating contractor support activities performed outside the K-H 94-3 Program organization.

The recent successful completion of the new BIO and the majority of the Priority upgrades was achieved by assigning or matrixing the key resources required directly to the K-H 94-3 Program Manager. This approach is appropriate for this effort and will be used for those tasks that are key program deliverables that require integrated cooperation of multiple organizations within the Integrating Management Contractor and First-Tier Sub-Contractor structure. For example, the K-H 94-3 Program Manager assembled a matrixed team to complete the BIO. For those tasks that primarily fall within a single element of the line organization, however, matrixed teams will not be used as they are unnecessary and would tend to undercut line responsibility; in such instances, program support efforts will be coordinated through the K-H 94-3 Program Manager. Thus, the maintenance of the BIO will be the responsibility of Safe Sites of Colorado (SSOC) Building 371 personnel.

The K-H 94-3 Program Manager has assigned full-time staff to manage the Recommendation 94-3 upgrade construction projects and has matrixed technical support staff to coordinate specific program support activities. A matrixed team reporting to the K-H 94-3 Program Manager will be assembled to complete the validation of Interim Storage upgrade projects now being initiated (see Section 6.3) to support the mission for Building 371.

Figure 2
Recommendation 94-3 Organization



The K-H Building 371 Project Director also reports to the K-H Vice President for Nuclear Operations and provides support to the 94-3 Program which is coordinated through the K-H 94-3 Program Manager. The SSOC Building 371/374 Project Manager provides matrix support to the 94-3 Program through the K-H Building 371 Project Director.

This organizational structure will provide the relevant technical expertise to implement a systems engineering approach through completion of the tasks defined in this IPP. The IPP organization may be revised only as necessary to reflect changes in the RFFO or Kaiser-Hill organizational structure and to support completion of the IPP.

1.1 Change Control

The IPP will be implemented on the schedule shown at Appendix B. The Department will implement the schedule as described herein and will report quarterly as specified below and otherwise, by exception only. The Board will be notified promptly of any changes that affect commitments to them. The plan may require additional corrections as key issues are resolved.

1.2 Deliverable Summary for Program Organization

The Department will continue to provide a quarterly status report for the Recommendation 94-3 IPP. The quarterly status report will provide the formal transmittal of the IPP deliverables to the Board and the status of the Site's progress on IPP activities. These will include Building 371 upgrades and authorization basis implementation status, Recommendation 94-1 coordination, funding status of required activities at the start of each new fiscal year, and progress toward assuring off-site shipment of SNM metals and oxide. Any changes in contingencies will also be discussed.

2. Completion of DNFSB 94-3 Sub-Recommendations

Recommendation 94-3 contains eight sub-recommendations with specific issues that the Board asked the Department to address with respect to the plans for storage of the Site's plutonium in Building 371. This section demonstrates how the Recommendation 94-3 sub-recommendations have been or are being addressed for the near-term mission of Building 371, including consideration of the unresolved technical issues communicated by the Board's March 13, 1996, letter to then Acting Under Secretary Grumbly.

Sub-Recommendation 1:

That an Integrated Program Plan be formulated to address the civil-structural-seismic safety issues and evaluations related to the planned use of Building 371 for storage of plutonium and related functions. This plan needs to be founded on the principles of systems engineering and realistic schedules. Several studies, pertinent to such a plan, are geologic fault investigation, ground motion studies, dynamic building analysis, and soil-structure interaction analysis. These studies and other elements need to be combined with the building mission and other functional criteria using systems engineering principles to develop the Integrated Program Plan.

Reference 39 documents the studies completed to address the civil-structural-seismic safety issues and evaluations and the selection of an appropriate Evaluation Basis earthquake (EBE) and Collapse Prevention earthquake (CPE) for which the building and its mission-required components, with upgrades, were shown to be adequate. All current and potential future facility missions were addressed in the evaluation except decontamination and decommissioning (D&D) activities in Building 371 which are not expected to introduce additional civil-structural-seismic safety issues. Thus, the Department has completed the actions identified under this sub-recommendation for Building 371, including formulating, providing, and now updating this IPP.

Sub-Recommendation 2:

That the plan address and explain any requirements for changes to the current Safety Analysis Report and how such changes will be accomplished. This includes effects from earthquakes, extreme winds, and floods.

The current Building 371 Final Safety Analysis Report (FSAR) is outdated and is being replaced by a newly approved BIO that addresses mission appropriate requirements of DOE Order 5480.23 [7]. This BIO affords comprehensive new hazard and safety analyses for building missions through 2002, identifies graded safety systems, and establishes a complete new control set for the facility. The BIO incorporates pending building upgrades, coordinating the completion of these upgrades with the implementation of the BIO.

The approved BIO addresses: (1) near-term missions of the facility for material consolidation, stabilization, repackaging, storage and other planned risk reduction activities; (2) changes to Site characteristics and design

or evaluation criteria for natural phenomena hazards due to the Seismic Hazard Analysis and the Wind and Tornado Study [10, 11]; (3) physical upgrades as a result of the studies following Phase I and AB development; (4) a new hazard and accident analysis; (5) derivation of Technical Safety Requirements (TSR) based on the hazard and accident analysis results and the requirements of DOE Order 5480.22 [12]; and (6) the identification of safety systems per sub-recommendation 6. Facility deactivation activities that may be conducted during operation are included in the BIO, but major D&D of Building 371 is not. End-of-life D&D will be addressed by revision or replacement of AB documents when Site pilot studies establish effective practices, Building 371 missions are complete, and building-specific D&D plans are developed.

The Department has concluded that the BIO, with particular attention to remaining risk dominant accident scenarios in the first annual update, followed by normal maintenance activities, will suffice to support Integrated Safety Management (ISM) for the facility through 2002. The bases for this conclusion include:

1. The Safety Management Programs required by the BIO are consistent with DOE Standard 3009, and have been supplemented with Integrated Safety Management and Activity Control.
2. The BIO affords a robust set of accident scenarios, made even more complete by separate evaluation of the hypothesized failure of each of the credited controls and of those combinations of credited controls judged to result in credible failure sequences. The resulting scenario set is sufficiently comprehensive to satisfy the requirements of DOE Standard 3009 for SAR accident analyses.
3. The system descriptions in the BIO, the functional requirements in the new TSRs, and the system and component requirements in the supporting system design documents ensure that identified safety systems will be maintained capable of performing their credited safety functions.
4. The principal difference between the completed document and an appropriately graded SAR involves the qualitative estimates of scenario frequencies in the BIO. These judgments were made conservatively, however, drawing upon Site experience with earlier more quantitative estimates. The resulting control set is not adversely affected by the frequency approximations.
5. The rebaselining of the hazard and accident analyses are consistent with the graded requirements of DOE Order 5480.23, the current storage mission, and planned risk reduction activities through 2002.
6. Considering the above, an upgrade of the BIO to a SAR equivalent form for the near-term mission would not be expected to impact the control set (TSRs).

If the interim storage mission (i.e. storage of oxides and metals through ~2015) reverts to Building 371, the AB for the facility will be revised to, or replaced with, one in a SAR form compliant with DOE Order 5480.23 to support the extended mission and the few post-stabilization nuclear activities which may accompany it. The Department has identified and completed the actions identified under this sub-recommendation to support the near-term mission (through 2002) for Building 371 and has identified and committed to an approach to complete additional actions should the interim storage mission (2002-2015) revert to Building 371.

Sub-Recommendation 3:

That a comprehensive document be completed describing in detail the structural analysis methodology and standards for the building analysis. This includes explaining analytical methods used and their applicability to the configuration of Building 371.

The Phase I Task 6 report [5] is a comprehensive document describing the standards and methods used for the structural analysis of Building 371. The Phase I Task 7 report [6] defined standards and methods used for seismic analysis of Building 371 safety systems credited in the safety strategy (see sub-recommendation 1 for Building 371, above). The Task 7 analysis applied the Seismic Qualification Utility Group (SQUG) process for seismic qualification of structures, systems and components (SSCs). These analytical methods are being used where applicable to design Building 371 upgrades. Thus, the Department has completed the actions identified under this sub-recommendation for Building 371.

Sub-Recommendation 4:

That the Integrated Program Plan use both deterministic and probabilistic methods to establish the vibratory ground motion criteria that will be used in the structural evaluation of Building 371. This includes a rationale for reconciling differences between the two methods. Moreover, these criteria should incorporate the results of a carefully planned and executed site geological faulting investigations.

As discussed in Reference 39, this sub-recommendation is addressed by the Phase I Task 4 study [3]. The report evaluated the results of the Site and local geotechnical investigations in terms of both the probabilistic and a deterministic seismic hazard approach. Based on the report, a consensus was reached on the appropriate EBE. Thus, the Department has completed the actions identified under this sub-recommendation for Building 371.

Sub-Recommendation 5:

That a hazard classification be selected for Building 371 which is supported by rational analysis. This requires consideration of the mission, period of intended use, and importance of the building.

In Phase I, the risk and accident consequences were identified, and practical steps to prevent or mitigate them were pursued, regardless of hazard classification, thereby obviating the need for formal classification. What resulted was an understanding that, with some improvement, Building 371 affords substantial seismic capacity and could meet PC-3 seismic standards. The Phase I evaluation and conclusions imply a hazard categorization indeterminate between 1 and 2. The seismic upgrades for consolidated plutonium storage vaults and for interim storage in Building 371, including the plans for material relocation, are based on this conclusion. Other activities planned in Building 371 for current missions such as wet combustible processing are of sufficiently limited scale to be consistent with a Hazard Category 2 designation. Thus, the Department has completed the actions identified under this sub-recommendation for Building 371.

Sub-Recommendation 6:

That the Integrated Program Plan, consistent with the hazard classification, include the plan for classification of safety systems on a rational basis consistent with the mission, life, and importance of Building 371. Issues associated with hazard classification and classification of safety systems are discussed in the Board's April 29, 1994 letter to Under Secretary Curtis.

The BIO identifies safety related SSCs. One means of safety SSC designation was based on accident consequences exceeding Evaluation Guidelines suggested for classification in DOE Standard 3011 [14]. In designating safety systems required to protect workers, consideration was given to systems that prevent or mitigate accidents involving radiological or toxicological hazards that would result in consequences less severe than the "immediately life-threatening or permanently disabling injuries" criterion of DOE Standard 3009 [16]. To further ensure worker safety, activity controls are invoked that require a process hazard assessment in a graded manner dependent upon the hazards and the degree to which the Site has a record of safe performance for the activity.

The practice of defense-in-depth was used as a second means to identify safety SSCs or administrative controls since typically, no single barrier is relied upon for preventing or mitigating release of hazardous materials that would result in consequences exceeding Evaluation Guidelines. Multiple barriers commonly include at least one safety SSC that is seismically qualified and a combination of other safety SSCs and/or administrative control programs. Following an EBE level event, the Building 371 structure and HVAC exhaust plenums will provide the seismically qualified safety barrier. Other SSCs completing the simple active confinement functions (e.g., HVAC fans, standby power) were separately identified as "Safety Margin" upgrades to EBE criteria (see Appendix C).

The safety SSCs have been differentiated so that those with the more important hazard mitigation functions are subject to more stringent requirements (e.g., design requirements, quality requirements, control of maintenance, safety evaluations of proposed changes, etc.). The remaining safety SSCs will be subject to requirements somewhat less rigorous, but still sufficient to ensure their safety function.

In the BIO, three risk-dominant accident scenarios exceed the public Evaluation Guideline of 5 rem. For these scenarios, additional effective controls are being investigated and will be incorporated in the first annual update to the BIO. They will also be evaluated as part of the validation for the Interim Storage upgrades to assess whether any new upgrades that emerge warrant completion for safe interim storage (see Table 6.2). The specific scenarios and the planned scope of investigation include:

1. Large Dock Fire in the Support Facility (5.9 rem for BIO Support Facility Fire 2, Case B residues, unlikely) – bounding consequences result when combustibles are present in quantity and configuration each violating administrative controls and a fire occurs. Investigation of potentially effective additional controls is focusing on: segregating most combustible deliveries on an alternative dock (e.g., Dock 5); providing faster acting sprinkler heads to limit fire size and number of impacted drums; upgrading ventilation (on either Dock 18T or the new Dock 21T); and extending the requirement that staged drums be attended to all residues (i.e., > 200g Pu) vs. those with greater than 1200g equivalent Pu content only.
2. Hydrogen Explosion in a Drum in Support Facility (31 rem for BIO Support Facility Explosion 1, Case D 3000 g residue drum, extremely unlikely) – bounding consequences result when a single drum with an undetected plugged vent is assumed to accumulate a 15% hydrogen atmosphere with sufficient oxygen to sustain rapid complete combustion which then occurs expelling the drum lid and a portion of the stored nuclear material. Investigation of potentially effective additional controls is focusing on: identifying a small sub-population of residue drums with the potential for such hydrogen accumulation should vent plugging occur; assessing the Site vent surveillance program to determine if it adequately precludes this event; and considering additional vent surveillance that might be required for a specific sub-population.
3. 2000-yr Earthquake (8.6 rem for BIO 371/374 NPH 2, unlikely) – bounding consequences occur when miscellaneous quantities of material outside the protected vault storage are involved in earthquake-caused mishaps, including local fire or explosion, that are not precluded by seismically capable safety systems. Investigation of potentially effective additional controls is focusing on each contributor to the overall dose in Table 5-54 of the BIO [42] to determine whether there are any high-marginal benefit upgrades to further reduce risk (e.g., I/I walk-downs might verify that residue drums on the ground floor, including the dock area, are not vulnerable to damage or could readily be protected as heavier utilities for the ground floor are located in the attic).

The Department has completed the actions addressing this sub-recommendation for Building 371 in developing the BIO and has identified and committed to supplemental actions to address those risk-dominant accident scenarios which exceed the public Evaluation Guideline of 5 rem.

Sub-Recommendation 7:

That any standards used in evaluating hazards from natural and man-made phenomena be comparable to those used in commercial nuclear practice.

The standards used for the structural evaluation of Building 371 in Tasks 6 and 7 are comparable to commercial nuclear standards. American Concrete Institute (ACI) Standard 349 [17], a nuclear plant concrete standard was used for calculation of concrete capacities and American Institute Steel Construction (AISC) N690 [18], a nuclear plant steel standard, was used for calculation of steel member capacities. Soil structure interaction analysis and structural dynamic analysis were comparable to the analysis used for commercial nuclear power plant structures. Similarly, dynamic soil pressures were calculated using American Society of Civil Engineers (ASCE) Standard 4 [19] methods, as would be done for nuclear power plants. The techniques used for seismic verification of equipment originated in the SQUG. The analysis report for Recommendation 94-3 Task 6 [5] formally documents the methods and standards used.

As part of the BIO development, current Department guidance was supplemented by applicable Nuclear Regulatory Commission (NRC) guidance, specifically the 10CFR50.63 requirements for consideration of station blackout. Other external events (e.g., adjacent facility hazards, transportation accidents, excessive snow loads, etc.) were also evaluated for their impact on Building 371.

The Department has completed the actions identified under this sub-recommendation for Building 371.

Sub-Recommendation 8:

That the Program Plan and results of its activities be used to specify building upgrade and improvements consistent with the mission of Building 371.

Phase I studies identified representative upgrades to Building 371, focusing on "high cost" systems, to ensure safe interim storage of the consolidated plutonium metal and oxide through about 2015. The studies following Phase I [21] validated a subset of those upgrades as Priority upgrades warranting prompt implementation even if the Building 371 consolidated plutonium storage mission was to end by 2002. The Department is nearing completion of the implementation of these upgrades.

Development of the Building 371 BIO resulted in additional upgrades being identified, including additional upgrades to low cost systems. Additional upgrades that arose during BIO development have been scheduled for implementation and design efforts are underway (see Section 3.3).

While end-of-life D&D activities for the facility are not sufficiently well planned to support current safety analyses, they have been judged unlikely to require any additional structural upgrades to the facility.

Finally, the Interim Storage upgrades (i.e., those not designated "Priority"), including Safety Margin upgrades, will be validated in FY98 and the validated upgrades will be implemented to ensure safe interim storage through 2015. Based on firm evidence that interim storage will not be a Building 371 mission, these Interim Storage upgrades may be discontinued as discussed in Section 6.

The Department has completed most of the actions identified under this sub-recommendation for Building 371 and has identified and committed to a validation approach that will complete the final definition of required upgrades.

3. Building 371

Goal I of this IPP is being implemented by accomplishing two objectives. The first involves ensuring that the Board's eight sub-recommendations are addressed as discussed in Section 2, while the second involves establishing operations in an upgraded Building 371 in conformance with an updated AB. This Section addresses the second objective for facility missions through 2002. The contingent mission of interim storage in Building 371 is addressed in Section 6.

As a result of the Recommendation 94-3 studies, physical upgrades and an updated AB for Building 371, consistent with its mission, are being accomplished. Building upgrades were identified during the Phase I studies as representative of those appropriate to reduce the risk in Building 371 should it be selected for the interim storage mission. The ensuing studies evaluated and selected a subset of those upgrades warranting priority and unconditional implementation to support the near-term Building 371 missions (which do not include interim storage); selection was based on their risk reduction effectiveness, schedule, cost, constraints on implementation, and adequacy of the resulting Building 371 capability to ensure successful performance of anticipated safety functions. The BIO has been developed, and will be implemented in accordance with the BIO-IP to become the AB of record for all Building 371/374 Complex current mission activities by August 1, 1998. The safety programs and SSCs which have a safety function in the BIO are being evaluated to assure they are adequately implemented as each phase is completed. Additional upgrades have been identified during BIO development and others may be needed as a result of the investigation of the controls needed for identified accidents exceeding the guidelines; these will be implemented in 1998. Two compensatory measures were instituted prior to implementation of the new TSRs; they included Operation Orders to control

acetylene in the building and to attend drums over 1200g Pu-equivalent when staged on the dock. These activities to identify and implement appropriate upgrades together with the BIO are the cornerstones for the plan to ensure safe operation of Building 371 for its assigned mission, including plutonium consolidation.

Other upgrades necessary to prepare Building 371 for the interim storage mission will be validated and implemented unless firm evidence that interim storage will not be a Building 371 mission justifies cancellation (see Section 6.3). Each validated upgrade will also be reviewed to determine whether its unconditional implementation is warranted to enhance safety of facility operation for near-term missions.

3.1 Mission Need

The goal of the upgrade and BIO development programs for Building 371 is to ensure the safe fulfillment of assigned building missions through 2002 with additional actions identified in Section 6 to extend that mission through 2015, if necessary. Safety is to be assured in the context of Integrated Safety Management by implementing the new TSRs, and by completing the defined hardware upgrades to address safety system requirements. The current missions of the building include baseline activities such as storage of the Site's consolidated plutonium metal and oxide inventories and mission program activities such as operation of the Caustic Waste Treatment System or residue stabilization and repackaging. A complete list of Building 371 activities reflecting assigned missions for planning purposes is provided by the Master Activity List (MAL). The BIO will maintain a comprehensive listing of authorized activities.

3.2 Functional Requirements

During the Phase I SSC review, an initial set of safety functional requirements was identified based in part on a draft Preliminary Hazard Analysis (PHA). The draft PHA was developed using existing inventories and hazards in Building 371, but did not address all currently proposed mission activities. Safety strategies and additional hazard analyses were then developed to mitigate postulated accidents for plutonium metal and oxide storage configurations proposed for the interim mission (that is, plutonium metal and oxide storage in DOE Standard 3013 [23] compliant containers). A "simple active" strategy was adopted. This "simple active" strategy assumes that exhaust fans with HEPA filters (and associated support systems) perform the principal active safety functions (i.e., maintaining negative building pressure).

The BIO identified a comprehensive set of safety functional requirements for current facility missions based on the new hazard and accident analyses. Active ventilation is required to be maintained for all accident scenarios except station blackout and severe NPH events. Upgrades to ensure passive confinement are being implemented to assure safety without electrical power available, however, turbine generator power is required to be maintained in its current configuration as a defense-in-depth measure which may afford active ventilation even for these events. As discussed in Section 2 for sub-recommendation 6, additional evaluation of risk-dominant sequences exceeding the public evaluation guideline is being performed to identify additional controls for incorporation in the first annual update of the BIO (September 1998). If validation of upgrades for the interim mission identifies any upgrades that significantly enhance safety, there will be additional safety functional requirements, perhaps as defense-in-depth.

3.3 Synthesis and Analysis

The post-Phase I studies identified seventeen priority upgrades for prompt, unconditional implementation (see Table 3-1). Fifteen of these upgrades improve existing safety functional capabilities in areas of fire protection, confinement (HVAC), criticality prevention, and worker protection. Eleven of the fifteen safety upgrades were completed by December 1997 as scheduled. The remaining four will be completed in 1998. The two non-safety upgrades were recommended for cost effectiveness rather than safety. With most material being removed from the sub-basement, the material transfer dumbwaiter upgrade has been placed on hold until a firm plan for again storing material there is established (see Section 6). The BIO development process tested the

completeness of this set of upgrades and supplemented it with additional upgrades (see Table 3-2) now being initiated to support BIO implementation.

The BIO has been developed addressing an upgraded Building 371 without the added conservatism proposed in the original IPP. The BIO was developed from an existing draft but grew into a robust document written to supersede the FSAR and to maintain safe operation of the building, given normal BIO maintenance activities, through 2002. The hazard analyses focus on hazards governing the appropriate facility-level controls, but the BIO control set requires separate process hazards analyses focused on worker safety, when necessary, to provide a complete safety basis for the authorized activities. Safety systems required to protect the public, worker and environment were identified as discussed in the response to sub-recommendation 6 (Section 2). System design descriptions for these safety systems were developed to support the BIO and were issued in July 1997 [48]. The system descriptions, written in the form of System Evaluation Reports (SERs), delineate the safety boundaries and document the basis for concluding that the required safety functions can be performed notwithstanding the incomplete design basis for the facility. Any additional upgrades needed to ensure the required functional performance have been identified and scheduled for implementation (with compensatory measures to be specified if required based on the phased implementation schedule).

Consistent with the Board's letter of March 13, 1996, to the Department, the approved BIO provides a safety analysis consistent with the present and anticipated mission of the building. The BIO also identifies facility hazards, requires preventative/mitigative measures to protect the public, facility workers, relocated workers, the mission of the facility, and the environment, and affords a comprehensive new set of TSRs.

3.4 Execution

The identified construction upgrades are being implemented and managed using Site project management procedures. Non-construction upgrades (e.g., implementation of a combustible loading control program and relocation of residues stored in Room 3189) are being implemented using Site processes, such as facility procedures and the Integrated Work Control Program (IWCP).

Detailed design and construction of the physical upgrades is being accomplished based on the system functional requirements. Testing and acceptance plans are being performed as required to ensure functionality.

The BIO was developed by multi-disciplined teams and is being implemented during operations to establish effective Integrated Safety Management. Implementation of the Program is being controlled by a formal implementation plan (BIO-IP) [45] that calls for phased implementation. Coordination of the BIO-driven upgrades will be coordinated with BIO implementation. For those BIO-driven upgrades that extend beyond August 1, 1998, provisions such as compensatory measures or written justification will be provided as appropriate to ensure an adequate authorization basis. During Phase I, a new seismic analysis of record for Building 371 SSCs (specifically the facility structure, HVAC equipment providing confinement and the main storage racks) was performed and implemented. The analyses developed during Phase I have been referenced from the SER for the Building Structure (Chapter 8) to ensure that the facility seismic capability is maintained through the existing Site Configuration Change Control Program (CCCP). Documents defining the EBE, main storage rack load limits, and equipment/structures credited in the seismic analysis have been referenced in the SER. The SER includes for reference the applicable load limits for storage throughout the facility and the requirements for drainage of water from around the embedded structures.

Table 3-1. Building 371 Priority Upgrades	
Project Description	Safety Upgrade/ Status
<ul style="list-style-type: none"> • Repair of Construction Line "T" Joint Repair joint and upgrade HVAC seismic supports near HVAC Systems 1 & 2 Bypass Valves 	Yes/Completed 9/96
<ul style="list-style-type: none"> • Filter Plenum Demister Analysis and Inspections 	Yes/Completed 9/97
<ul style="list-style-type: none"> • Penetrations for Room 3206 Fire Wall (DOE Standard 3013 Repackaging Room) 	Yes/Completed 12/97
<ul style="list-style-type: none"> • Combustible Loading Control Program (CLCP) 	Yes/Completed 9/97
<ul style="list-style-type: none"> • Seismic HVAC Upgrades Plenum and Fan Seismic Structural Support Upgrades 	Yes/Completed 2/98
<ul style="list-style-type: none"> • Fire Doors Repair and/or Replace Facility Fire Doors 	Yes/Completed 9/97
<ul style="list-style-type: none"> • Subsurface Drain System Develop inspection procedures, perform drain inspections, and engineered plan defining actions on loss of drain system 	Yes/Completed 9/97
<ul style="list-style-type: none"> • Resolve HVAC Supply Isolation Capability – Complete evaluation of HEPA filtration option and implement HEPA filtration or alternative using isolation valve 	Yes/To Be Complete 7/98
<ul style="list-style-type: none"> • Plenum Deluge System Modifications, backup N2 supply and valve redesign 	Yes/To Be Complete 5/98
<ul style="list-style-type: none"> • Egress Route Upgrades Remove stairwell crash bars, signs, etc. 	Yes/Completed 9/97
<ul style="list-style-type: none"> • Life Safety Code Exemption Prepare exemption for egress routes not in compliance to the Life Safety Code 	Yes/Completed 9/97
<ul style="list-style-type: none"> • Basement Level Fire Walls Upgrade basement walls to NFPA criteria for protection of HEPA filters 	Yes/Completed 12/97
<ul style="list-style-type: none"> • Seismic Bracing for Attic Water Pipes 	Yes/Completed 4/98
<ul style="list-style-type: none"> • Relocate high risk residues in Room 3189 	Yes/Completed 12/97
<ul style="list-style-type: none"> • Implement S/R Load Limits 	Yes/Completed 9/97
<ul style="list-style-type: none"> • Replace Cooling Tower 	No/ In Design
<ul style="list-style-type: none"> • Material Transfer Dumbwaiter Ground Floor to Subbasement Levels 	No/ On Hold

Table 3-2. Building 371 BIO-Driven Upgrades	
Project Description	Safety Upgrade
• Install Emergency Lights – Provide seismically qualified egress emergency lighting	Yes
• Evaluate/Reinforce HVAC Ducting – Ensure ducts credited for tertiary confinement have adequate pressure capacity for tornado atmospheric pressure transient or abnormal ventilation lineups	Yes
• Ensure Lightning Protection – Ensure that security systems to prevent helicopter intrusion do not compromise lightning protection for Building 371	Yes
• Inspect/Repair SC-3 Fire Barriers – Apply lessons learned from Room 3206 evaluation as necessary to ensure one-hour capability of fire barriers that are SC-3	Yes
• SNM Storage Rack Repairs – Ensure adequate seismic capacity for storage racks used in vault-type material storage rooms	Yes
• HVAC Interlock Modifications – Ensure safe failure mode in EBE for the supply fan trip function and upgrade interlock to trip return fans as well as supply	Yes
• Extend Roof Drains – Improve runoff during extreme weather conditions	Yes
• Nitrogen System Failure Prevention Modifications – Ensure nitrogen shut-off as Passive Design Feature in BIO to prevent Central Storage Vault (CSV) and facility pressurization following an earthquake	Yes
• Counterfeit Bolt Inspection – Review usage of counterfeit bolts and replace any whose capacity will not meet requirements of BIO for SC-1/2 systems	Yes
• Redundant Zone 3 HVAC Controllers – Provide redundant ΔP controllers in Zone 3/Zone 4 areas for reliable implementation of LCO 3.1, Item 6	Yes
• Drain Chemical Storage Tanks – Reduce inventories of potassium hydroxide and nitric acid in outdoor storage tanks to meet requirements of AC 5.2.2, items e and f	Yes
• Upgrade Vault Penetration for Fire Where Practical – Upgrade CSV and vault boundaries to SC-1/2 (2-hour rating) fire barrier requirements where practical	Yes
• Repair Attic Beam – Compensate for omitted negative reinforcement in function of beams B55 and B56	Yes
• Install Attic Leak Detection – Provide capability to detect and alarm if significant attic flooding occurs	Yes
Miscellaneous BIO Upgrades	
• Install dock 18T roll-up door interlock	Yes
• Verify seismic capacity of SC-1/2 HVAC ΔP sensor lines	Yes
• Provide lab propane tank seismic supports	Yes
• Complete any additional SQUG walk-downs	Yes
• Determine HVAC scrubber disposition	Yes
• Provide seismic restraint for flammable liquid cabinets	Yes
• Life Safety Code Upgrades – Correct deficiencies in B371 (Material Access Area) per updated facility fire hazards analysis	Yes

3.5 Operation

Implementation of the new TSRs and the ensuing facility operation in accordance with the approved Authorization Agreement will ensure Integrated Safety Management in Building 371. The BIO commits to or requires the supporting programs necessary for effective ISM. The BIO will be maintained current as facility missions evolve, issues emerge, or experience demonstrates the need for changes.

The procedure modifications and training required as a result of upgrades and any other system functional requirements defined by the BIO will be implemented in accordance with Safety Management Procedures described in Chapter 3 of the BIO.

3.6 Closure

Facility D&D will be addressed by an update to the BIO prior to implementing D&D activities. The D&D will be coordinated with the Site Closure Project through the Site closure and annual work plans.

3.7 Contingencies

The RFETS closure process is dynamic with continual review of bottlenecks or new opportunities for increased efficiency which may arise. As part of this process, specific missions may be assigned to or taken away from Building 371. A recent example is the decision to process high level liquids in Building 371, rather than in Building 771. Another example is the decision to install the packaging portion of the PuSPS line planned for Building 707 in Building 371 instead. Each such contingency will be accommodated through the safety review process, ensuring that significant new hazards are analyzed, that appropriate controls are added to the BIO, and that evolving facility operations are safely conducted.

3.8 Deliverable Summary for Building 371 Baseline

- 3-1 Report completion of modifications in FY96 of the column line "T" construction joint to increase the seismic capability of Building 371 and of the HVAC bypass valve supports to complete qualification of the passive confinement boundary for the new Building 371 EBE. Report completion of a final fire hazard analysis in FY96. **COMPLETED ON SCHEDULE**
- 3-2 Report completion of priority safety upgrades specified in Table 3-1 by the end of 1997. **11 OF 15 COMPLETED ON SCHEDULE**; remaining four will be completed by July 1998.
- 3-3 Establish and document operation of Building 371 in conformance with an updated Authorization Basis by August 1, 1998.
- 3-4 Issue schedule (implementation plan) for further Building 371 upgrades identified during the initial AB development by November 1996. **COMPLETED AUGUST 1997**; upgrade completion no later than October 1998 being managed to a schedule coordinated with the BIO-IP.

4. Integrated Pu Consolidation and Management

The insights gained from the Recommendation 94-3 studies in Phases I and II needed to be integrated with the actions committed to the Board under Recommendation 94-1 to ensure an integrated Site plan for safe plutonium and uranium management and storage. These insights included the contribution to overall Site risk from residues, the improved safety of Building 371 with Priority upgrades and a new BIO, and the commitment to provide an assured facility (on- or off-site) for interim storage of Site SNM. Systems engineering principles were applied to develop and select a strategic approach for residue storage and shipment that incorporates timely consideration of contingencies, such as possible delays in the Waste Isolation Pilot Plant (WIPP) opening. The approach that was selected is being implemented through the Site's 94-1 Program.

The 94-1 Program is also reducing the risk of SNM storage by stabilizing and repackaging the material, the DOE-STD-3013 compliant packages and the POCs afford defense-in-depth for current storage and enable the longer term storage plans to be realized.

4.1 Mission Need

A Site mission is to stabilize, store and ultimately ship off-site its plutonium and uranium inventory. Safe achievement of this mission requires, pending shipment, the reduction of the Site risk to a small fraction of the risk from plutonium holdup as of 1996. This mission entails:

- preparing uranium and plutonium metals and oxides for safe longer-term storage and either shipping them off-site or placing them into interim storage; and
- consolidating and/or stabilizing and repackaging plutonium residues for storage pending off-site shipment.

An existing framework for plutonium consolidation and management is currently in place under the Site Integrated Stabilization and Management Plan (SISMP) [25]. The SISMP reflects the plans for accomplishing the Recommendation 94-1 Implementation Plan objectives. In addition, the evolving Site closure plan envisions reducing the total cost of reaching an acceptable end state for the Site by accelerating work onsite or transferring non-closure missions off-site if possible. The insights and decisions from the Recommendation 94-3 Phase I and subsequent studies require integration with both the SISMP and closure plans, and must occur within the constraints of these other major programs.

The effectiveness of these programs, and the integration of the Recommendation 94-3 actions, will be measured by completing the necessary actions to decrease the incremental Site risk from interim storage to a small fraction of the 1996 risk due to plutonium holdup in the Site's buildings, by the end of 2002.

4.2 Functional Requirements

The objective of the program outlined in the following sections is to incorporate the insights from the Recommendation 94-3 Phase I studies and the decisions regarding Priority Building 371 upgrades and alternatives for storage into the existing framework of programs for material consolidation, stabilization, repackaging and interim storage. In particular, a strategy for interim residue storage pending off-site shipment is required that addresses the risk identified in Phase I from dispersible residue forms (Section 4.3 describes the strategy that has been selected). The strategy is being implemented through the primary plan that captures the scope of current plutonium management activities in progress, the SISMP.

Important plutonium handling functions, programmatic elements of planning that link Recommendation 94-1 and 94-3 implementation, are shown in Table 4-1. Plans for interim storage and shipment of material are preliminary and subject to change.

Table 4-1. Pu Handling Functions for Recommendations 94-1 and 94-3	
Function	Requirement
Consolidation	<ul style="list-style-type: none"> ◆ Reduce public risk from oxides and from the more dispersible residues ◆ Minimize worker dose from multiple material movements
Stabilization	<ul style="list-style-type: none"> ◆ Reduce worker risk from potentially unstable material ◆ Meet Interim Safe Storage Criteria for residues ◆ Meet DOE Standard 3013 stabilization requirements for oxides and metals

Table 4-1. Pu Handling Functions for Recommendations 94-1 and 94-3	
Function	Requirement
Packaging	<ul style="list-style-type: none"> ◆ Meet DOE Standard 3013 packaging requirements for oxides and metals ◆ Meet Interim Safe Storage Criteria for residues and resultant TRU waste ◆ Reduce public risk from the more dispersible residues and resultant TRU waste
Storage	<ul style="list-style-type: none"> ◆ Move metal and oxide inventory in DOE Standard 3013 compliant containers to a facility to be approved for interim storage ◆ Establish safe residue storage; reduce public risk from the more dispersible residues via packaging
Shipment	<ul style="list-style-type: none"> ◆ Ship residues and/or resultant TRU waste to a facility to be approved ◆ Ship oxides and metals off-site ◆ Complete off-site pit shipments

4.3 Synthesis and Analysis

The planned actions to evaluate alternatives to meet the above mission and functional requirements for dispersible residues prior to off-site shipment as presented in Reference 39 have been completed [49]. The selected alternative relies upon packaging in Pipe Overpack Containers (POCs) [50] as the primary means of limiting dispersion for residues of concern. The vented POCs have added advantages in increasing the TRUPACT-II shipping capacity and facilitating compliance with WIPP Waste Acceptance Criteria for some packages. Some ash residues may be immobilized providing additional (defense-in-depth) limitation of their dispersion potential while also facilitating safeguards termination. Residue consolidation prior to stabilization is recommended for the final remaining residues from Buildings 771 and 776/7 only when the facilities are otherwise ready for deactivation.

Actions to implement the selected alternative were incorporated into the SISMP [25] and their completion is being managed through the Site's 94-1 Program.

4.4 Execution

Based on the mission, the functional requirements and the alternative selected, the actions being taken to address Recommendation 94-3 insights and decisions have been incorporated by revision into the SISMP for execution. The SISMP also provides plans and schedules for other Recommendation 94-1 activities that are necessary to fulfill the goals of this IPP, including the stabilization and packaging of Pu metals and oxides into DOE-STD-3013 compliant containers. The current ongoing stabilization and packaging activities of the SISMP afford demonstrable risk reduction for dispersible residues when packed in POCs and drums. These will be WIPP-ready and provide defense-in-depth for other Pu materials, lessening the potential for their release in earthquakes or fires.

4.5 Operation

The procedure modifications and training required as a result of Recommendation 94-3 issues will be accomplished using Site procedures for integrated operations activities defined in the implementing programs. Conduct of stabilization, packaging, and shipping activities will be subject to appropriate controls in accordance with the authorization bases for the facilities involved; these controls will ensure activities are conducted consistent with Integrated Safety Management.

4.6 Closure

Closure will occur upon completion of the activities that reduce the Site risk from residues by packaging dispersible residues in the POCs and; for oxides, metal and pits, by off-site shipment. If off-site shipment of oxides and metals does not occur as scheduled, they will be placed in interim storage in Building 371.

4.7 Contingencies

The Site is continuing to examine alternatives for residues that might expedite Site closure with or without requested variances being granted to the Department's Safeguards Termination Limits for residues. Options include shipment of some residues to other sites in the Department of Energy complex for stabilization and packaging, which may or may not include some plutonium recovery. Further, the stabilization technologies adopted for use at the Site entail some residual uncertainty (e.g. quality of semi-vitrified ash TRU-waste product in single pass stabilization and vitrification). As contingencies such as these emerge and are resolved, the SISMP will be updated. Changes will be reviewed to ensure that the Recommendation 94-3 concerns regarding potential residue dispersion remain resolved by the updated plan.

4.8 Deliverable Summary for Integrated Pu Consolidation and Management

- 4-1 Evaluate and select material management alternatives for "high dispersibility" residues by February 28, 1997. **COMPLETED ON SCHEDULE**
- 4-2 Incorporate selected residue alternatives into existing Site programs by April 15, 1997. **COMPLETED ON SCHEDULE**
- 4-3 Establish and document interim storage for the Site's Pu inventory, including residues, by the end of 2002 in a configuration that reduces Site risk due to plutonium (metal, oxides and residues) to a level that is a small fraction of the risk from plutonium holdup as of 1996.

5. Integration of Site Plans with DOE Complex Plans

This Section provides the Department's baseline plan to prepare for and complete shipment of the Site's uranium and plutonium metal and oxide beginning no later than 2002. The baseline plan is a commitment that will be executed as planned unless sufficient impediments to off-site shipment emerge to cause the Department to abandon this strategy. The Department would then rely upon Building 371 for safe onsite interim storage (Section 6). Significant Departmental plans which have the potential to impact Rocky Flats' implementation of this IPP are not all formally completed, but include the draft Accelerated Cleanup: Focus on 2006 [47] plan, the Surplus Plutonium Disposition EIS, a draft of which is expected to be issued in April 1998, and the completed documents described below. The uncertainties associated with these inter-related plans are acknowledged, and are the subject of management actions by several managers outside the organization structure described in Section 1. This section of the IPP describes a mechanism for integrating and coordinating Departmental actions contributing to resolution of programmatic uncertainties, and shows the dependence of Site plans on the rest of the complex.

The Recommendation 94-3 studies conducted to date and the subsequent decision to move forward with off-site shipment to obviate onsite interim storage of the Site's Highly Enriched Uranium (HEU) and plutonium metal and oxide inventories provides the basis for the activities described in Section 5. The Department's Record of Decision (ROD) for the Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement (PEIS) issued in January 1997 [46] documents decisions to consolidate pit storage at Pantex, to expand the storage capacity of the Actinide Packaging and Storage Facility (APSF) at the Savannah River Site (SRS) to accommodate Rocky Flats metals and oxides, and to consolidate HEU at Oak Ridge. The non-pit Pu decision, however, was subject to: 1) stabilization and packaging of the RFETS surplus non-pit plutonium materials (not including residues); 2) completion of the APSF at the

expanded capacity (planned for 2001); and 3) issuance of a ROD for a follow-on Surplus Plutonium Disposition site Environmental Impact Statement (EIS) calling for immobilization of plutonium at SRS. The Surplus Plutonium Disposition site EIS applies to the mission of plutonium immobilization for disposition and to the actual shipment of Rocky Flats material to SRS. The expansion of the APSF capacity to accommodate possible transfer of Rocky Flats material was evaluated and authorized by the January 1997 PEIS ROD.

5.1 Mission Need

A joint regulatory agreement between the Environmental Protection Agency, the State of Colorado and the Department, the Rocky Flats Cleanup Agreement [51] commits to removal of plutonium materials from the Site by 2015. The accelerated closure of Rocky Flats is a goal established in the Accelerated Cleanup: Focus on 2006 [47] plan. Availability of receiving sites and facilities, shipping resources, and determination of the forms and packaging requirements necessary to ship materials are all key uncertainties in current planning, and all are subject to ongoing management actions in which Rocky Flats is a participant.

5.2 Functional Requirements

The objectives of off-site shipment are to prepare material for shipment, perform required environmental evaluations, provide an approved receiving facility for interim storage, transport the material safely for storage, and plan for end of life facility deactivation. The essential functions and requirements identified for off-site shipment include, but are not limited to, those shown in Table 5-1. The functional requirements will guide the implementation (see Section 5.4 Execution) of off-site shipment and facilitate the evaluation of alternative approaches which may emerge (see Section 5.7 Contingencies).

Table 5-1. Off-Site Shipment Requirements	
Function	Requirement
Prepare Non-Pit Material for Off-Site Shipment	<ul style="list-style-type: none"> Stabilize Pu oxides, package metals and oxides in DOE-STD-3013 compliant containers
Complete Required Environmental Reviews	<ul style="list-style-type: none"> Issue ROD for plutonium disposition at SRS Provide evaluation and approval of alternatives for any accelerated shipment
Construct (or Prepare) Non-Pit Storage Facility and Approve for Use	<ul style="list-style-type: none"> Construct APSF at SRS and demonstrate readiness Provide alternative approved storage facilities if required for accelerated shipment
Transport the RFETS Pu and HEU per DOT/DOE Requirements	<ul style="list-style-type: none"> Ship pits packaged in FLs to Pantex in SSTs Obtain approved shipping containers for non-pit materials Ship non-pit materials to SRS in SSTs Resume and complete shipments of HEU to ORNL
Storage Facility Operations	<ul style="list-style-type: none"> Monitor stored material per DOE Standard 3013 for metal and oxides Provide for handling, inspection and recovery for a potentially failed container Provide a DOE Standard 3013 packaging installation in the APSF
Safe Decontamination and Decommissioning at End of Life	<ul style="list-style-type: none"> Storage plans shall incorporate requirements that will facilitate future storage facility D&D

5.3 Synthesis and Analysis

Several representative alternatives for interim plutonium storage throughout the Department of Energy complex were considered during the programmatic evaluation of storage and disposition [46]. Principal

alternatives included storage at each site with material, a single centralized storage facility, and a hybrid option involving material shipment from selected sites only. The chosen alternative for Rocky Flats material involves off-site shipment for interim storage, with HEU going to Oak Ridge, pits going to Pantex and non-pit surplus plutonium going to SRS once certain conditions are met. The base plan in this Section addresses the implementation of that chosen alternative, including the means the Department will use to ensure that completion is timely.

5.4 Execution

For each function identified in Table 5-1, the DOE has assigned responsibility to an individual Department Manager to accomplish the required actions as follows:

1. **Prepare Non-Pit Material for Off-Site Shipment** – DOE/RFFO Manager has primary responsibility for this function. The Site's contractors have planned and are performing the required activities per the SISMP [25]. The Department is directly furnishing the plutonium packaging line which is being installed in Building 371.
2. **Complete Required Environmental Reviews** – DOE/HQ Director, Office of Fissile Materials Disposition (MD-1) has primary responsibility for the timely completion and issuance of the ROD for the Surplus Plutonium Disposition site EIS. The ROD is scheduled to be issued by February 1999. Specific evaluations to support accelerated shipment options have yet to be identified. EM-1 would coordinate the performance of such evaluations even if their specific nature caused the assignment of their preparation to a specific site (e.g., Manager, Savannah River Operations Office (SRO) may have lead for preparation).
3. **Construct (or Prepare) Non-Pit Storage Facility and Approve for Use** – DOE/SRO Manager has primary responsibility for ensuring the timely completion of APSF construction and startup testing. Construction is funded beginning in FY99 and is scheduled to begin in October 1998. Startup testing is scheduled to be completed in October 2001. Should a future decision be made to prepare alternative storage facilities for earlier receipt of Rocky Flats material (e.g., inactive reactor containment facilities), such preparations would also be the responsibility of DOE/SRO Manager.
4. **Transport RFETS Surplus Pu and HEU per DOT/DOE Requirements** – DOE/RFFO Manager has primary responsibility for the planning and safe conduct of shipments of surplus pits to Pantex, shipments of non-pit Pu materials to SRS, and shipments of HEU to Oak Ridge. Pit shipments were initiated in FY97 and will be complete no later than FY99. No non-pit Pu shipments will take place until the three conditions applied to transfer of material to SRS are satisfied or revised. DOE Albuquerque Operations Office (AL) Manager has the responsibility for providing certification and procedures for pit shipping containers and SSTs for all plutonium shipments. EM-1 has responsibility for providing certification and procedures for non-pit Pu shipping containers, and for ensuring that Savannah River Site plans for and receives necessary funding to receive Rocky Flats non-pit Pu. DP-1 has responsibility for ensuring that Pantex and Oak Ridge plan to receive Rocky Flats pits and HEU, respectively. EM-1 is responsible for negotiating funding to support Pantex and Oak Ridge receipt of Rocky Flats material. Pantex, Savannah River, and Oak Ridge Operations Office Managers have responsibility for preparing for and receiving completed shipments. Initial shipments of sand, slag and crucible residues are expected to be made from the RFETS to SRS in June 1998; these shipments, when they occur, will demonstrate that SST shipments along the proposed corridor can be made as planned.
5. **Storage Facility Operations** – DOE/SRO Manager has primary responsibility for APSF operations; see Section 5.5.
6. **Safe Decontamination and Decommissioning at End of Life** – DOE/SRO Manager has primary responsibility for D&D planning for APSF; see Section 5.6

Overall responsibility within the Department to establish a closure plan for Rocky Flats and to coordinate activities of supporting Site Managers and Assistant Secretaries is assigned to the Assistant Secretary for Environmental Management (EM-1).

5.5 Operation

Conduct of off-site storage operating activities (e.g., APSF) will be subject to appropriate controls in accordance with the authorization bases for the facilities involved. These controls will ensure activities are conducted consistent with Integrated Safety Management.

5.6 Closure

The facility planned for interim storage is being designed and will be operated with consideration of the importance of minimizing radioactive contamination to facilitate decontamination of the facility at the end of its life. During the design phase, the functional requirements will require the A/E to incorporate into the design, methods to facilitate demolition at the end of facility life.

5.7 Contingencies

An option has been identified to achieve accelerated shipment of non-pit Pu from Rocky Flats to SRS for storage in an inactive reactor containment facility. This option is included as representative of various accelerated closure options that may be identified and studied by the Department. This option is the subject of ongoing study to determine whether the advantages it affords in potential acceleration of Site closure outweighs its cost and any adverse schedule impacts for SRS. This option involves the preparation of an existing facility for receipt and storage of Rocky Flats non-pit Pu which may be packaged in containers that are not compliant with DOE-STD-3013. Stabilization and packaging in 3013 containers could take place at SRS. The pursuit of this option would require a coordinated action plan, including appropriate NEPA evaluation, prior to any decision to proceed. If an alternate to APSF is selected, the Department will inform the Board through the quarterly report.

Planned shipments of Site HEU to Y-12 at Oak Ridge have been suspended in FY98. Shipment of HEU is anticipated so that interim storage of this material onsite would not be required. Should there be further delays to the point that shipment by 2002 could not be assured, interim storage onsite would be required. Building 371 is the most likely facility for such a mission. If shipments are not planned for resumption by FY 2000, an evaluation will be performed to establish a contingent onsite storage strategy.

5.8 Deliverable Summary for Off-Site Shipment of SNM

- 5-1 Issue ROD selecting the plutonium immobilization site by February 1999.
- 5-2 Prepare APSF, or alternate facility, at SRS for Rocky Flats SNM.
 - a. Complete APSF design by August 1998.
 - b. Initiate APSF construction in October 1998 with sufficient capacity to accommodate both SRS and Rocky Flats material, or begin modification of alternate facility to receive the RFETS plutonium.
 - c. Complete APSF construction and startup testing by December 2001.
- 5-3 Prepare for and transport SNM off-site.
 - a. Complete off-site shipment of pits to Pantex by FY99.
 - b. Ship plutonium-bearing materials (sand, slag & crucible) from Rocky Flats to SRS in SSTs in June 1998.

- c. Procure approved shipping containers (9975s) for metal and oxide shipment.
- d. Begin off-site shipment of non-pit plutonium by October 2001, and complete by September 2004.

6. Interim Storage Mission Contingency – Building 371

This Section provides the Department’s plan to prepare Building 371 for storage of the Site’s Pu metal and oxide from 2002 to 2015 (i.e., interim storage). The Department believes that it will demonstrate sufficient progress toward off-site shipment of the Pu metal and oxide in the future, consistent with the schedule in Appendix B, to justify suspension of Interim Storage upgrades and preparation of the SAR. The Department will status the Board on the progress of the Go/No Go criteria in Deliverable 6-5 through quarterly reports, and will formally notify the Board if all the criteria are met prior to the decision to suspend work on the Interim Storage upgrades. Work on the Interim Storage upgrades will be conducted as scheduled in Appendix B, and will not be suspended unless all of the Go/No Go criteria are met and notification is made to the Board.

The Board made its Recommendation 94-3 [29] recognizing in part that once Site plutonium was consolidated into Building 371, any plans the Department might make to remove it would involve elements the Department could not control. Thus, the duration of the storage mission was uncertain. Recommendation 94-3 sought assurance from the Department that storage in Building 371 would not be allowed to default to an unsafe condition should the mission be extended. This section identifies actions that are being taken in FY98 and will continue as necessary to prepare Building 371 for interim plutonium storage by 2002 until off-site shipment is demonstrated to be on a course that adequately ensures success (hence obviating an interim storage mission in Building 371).

6.1 Mission Need

The mission for the Building 371 contingency option is to provide safe and secure interim storage of the Site’s non-pit plutonium metal and oxide inventory, including any oxide generated due to residue and solution stabilization activities, if off-site shipment is not realized in a timely manner. The interim storage mission is to begin in 2002 and continue until the inventory is finally shipped off-site (no later than 2015).

6.2 Functional Requirements

The objectives of the Building 371 interim storage option are to: prepare material for interim storage; validate and schedule Interim Storage upgrades (i.e., those not designated “Priority” in Appendix C); design, construct, and/or otherwise implement the validated upgrades; revise the BIO to a SAR-equivalent form for interim storage; conduct storage operations safely; and plan for end of life facility D&D. The corresponding essential functions and requirements identified for the Building 371 storage option include, but are not limited to, those shown in Table 6-1. The functional requirements will guide both the upgrade validation (see Section 6.3 Synthesis and Analysis) and the implementation (see Section 6.4 Execution) of this option. The functional requirements will also facilitate the evaluation of alternatives which may emerge (see Section 6.7 Contingencies).

Table 6-1. Essential Functions and Requirements for B371 Contingency	
Function	Requirement
Prepare Non-Pit Plutonium for Interim Storage	<ul style="list-style-type: none"> • Stabilize Pu oxides, package metals and oxides in DOE-STD-3013 compliant containers
Validate and Schedule Interim Storage Upgrades	<ul style="list-style-type: none"> • Assess non “Priority” upgrades in Appendix C to validate, delete, or replace • Determine priority/utility for current mission of validated upgrades • Establish upgrade schedule for assured completion by 2002

Table 6-1. Essential Functions and Requirements for B371 Contingency	
Function	Requirement
Design/Construct/Implement Interim Storage Upgrades per Schedule	<ul style="list-style-type: none"> • Perform scheduled upgrade tasks • Monitor progress toward off-site shipment to determine when success is adequately assured
Revise AB for Interim Storage Mission	<ul style="list-style-type: none"> • Add interim storage activities (including permitted deactivation) and remove completed stabilization and packaging activities • Revise hazard and accident analyses in SAR-equivalent form • Establish controls for interim storage • Identify any additional required upgrades
Conduct Storage Facility Operations Safely	<ul style="list-style-type: none"> • Monitor stored material per DOE Standard 3013 for metal and oxides • Provide for handling, inspection and recovery for a potentially failed container
Provide for Safe Deactivation and End-of-Life Facility Decontamination and Decommissioning	<ul style="list-style-type: none"> • Establish criteria and plan for deactivation permissible during interim storage • Perform deactivation per plan during storage operations • Plan for balance of D&D after SNM shipped off-site

6.3 Synthesis and Analysis

The validation and scheduling of the Interim Storage upgrades in Appendix C (i.e., those that are not designated "Priority") require an assessment founded on the principles of systems engineering. These upgrades were originally identified early in 1996 [35] and significant changes pertinent to their selection have since taken place. The more significant ones include:

- Surplus plutonium in pit form is being shipped off-site. Progress to date enables the Department to commit to complete pit removal by FY99 as planned. There is a significant potential that shipments may be completed in FY98. These shipments affect the planned renovation of new vaults for their long term storage and the date by which the existing vaults are expected to be available for other purposes. This change alone reduces the scope of required upgrades by about \$10M (since new vaults on the ground floor for this material will no longer be required) and warrants an evaluation of the potential for enhancing safety by earlier completion of some "Material Relocation" upgrades.
- The BIO affords many detailed insights into residual risk that were not anticipated when the other upgrades were chosen. For example, the BIO affords detailed fire calculations and highlights the importance of effective combustible control for assuring current facility safety. Moreover, more rigorous combustible control should be achievable for interim storage since other building activities (including construction and material stabilization) will then be complete. For example, removal of inactive HVAC scrubber tanks may enhance safety more than the "Safety Margin" upgrade to install deluge recharge piping. The Safety Margin upgrades focused on fire risk warrant review from this perspective.
- The Site's closure plan [47] includes some significant changes in the vision of the Site in the 2002 time frame relative to the preliminary Accelerated Site Action Project (ASAP) [26] vision at the time that the Safety Margin upgrades were selected. The two largest impacts involve decisions that: 1) the Site boundary will be maintained at its current location at least until stored plutonium is shipped off-site; and, 2) the Site fire department will be maintained while plutonium buildings remain. These commitments lessen the urgency and importance of some of the Safety Margin upgrades.
- The planned reconfiguration of the Perimeter Intrusion Detection and Alarm System (PIDAS) is necessary to shrink the Protected Area if the mission of Building 371 is prolonged relative to the other plutonium buildings. The timing is governed more by the remaining plutonium inventory in Building 707 than by the safety requirements of Building 371. Safeguards and security requirements applicable to Building 371

while surplus material is stored there must and will be met at all times. Thus, it appears reasonable to decouple this upgrade from those necessary to prepare Building 371 for safe interim storage.

- The 100 degree centigrade limit in DOE-STD-3013-96 [23] for stored metals drove the need for ventilation upgrades to the main floor storage vaults and increased the importance of emergency power for the HVAC fans. Programs at Los Alamos have been addressing the safety importance of this requirement. The conclusions of these program activities, and any changes to the Standard, need to be evaluated.

Accordingly, the necessary assessments to validate the Interim Storage upgrades and to establish the scope of those which are validated will be completed in FY98 (deliverable 6-1) using a systems engineering approach.

Summary of Validation Approach

Engineering for the Interim Storage upgrades will be initiated in FY98, beginning with validation. The upgrades to be considered during validation and the specific validation requirements to be addressed for each are given in Table 6-2. In addition, as part of the validation efforts, the scope, cost and schedule estimates will be updated for each validated upgrade. As part of this effort, studies needed to finalize the design concepts will be performed. The scope for the upgrades that are validated will be updated with sufficient detail to support completion of design in FY99 and to confirm that construction of the upgrades can be completed by 2002.

The criteria for upgrade validation will focus on key safety functions (e.g. confinement, fire protection, worker safety) and seek to reduce the risk for interim storage in Building 371 (relative to near-term storage) in order to keep pace with the anticipated progress in reducing Site risk early in the interim mission. The Site risk is being reduced as Pu materials are stabilized and repackaged, off-site waste shipments are completed, and building holdup is stabilized, packaged as waste, and shipped off-site. The Site closure plan [47] now maintains the current Site boundary until all SNM is shipped off-site. Given the Site boundary, the DOE Standard 3011 [14] evaluation guidelines for identifying accident scenarios that warrant safety systems will not necessitate some specific upgrades to achieve the desired low level of risk. Instead, the selection decisions will be governed by the degree of conservatism with which such safety systems are identified and by the overall safety margin provided by both the credited and the defense-in-depth controls.

Thus, the validation effort will continue pursuing reduced risk for the interim mission, with appropriate allowance for valid new information. The intent is to maintain the SNM storage risks as a small fraction of other risks on the Site until those other risks are reduced to a sufficiently low level that this objective becomes both impractical and unnecessary from a safety perspective.

As the final element of the validation activity, each upgrade validated for the interim mission will be checked to see if accelerated implementation is warranted based on the benefits of priority implementation for the current mission, but also considering the impact of early implementation on competing Site priorities. For example, early oxide relocation to the sub-basement is possible given the progress on pit shipments, and an evaluation of this option will be made. The evaluation will consider the fact that there are other potential uses for the vaults prior to 2002 and complications that may arise with implementation. The sub-basement vaults are well suited for minimizing worker doses from high Americium residues waiting to be stabilized and repackaged as waste or for enabling accelerated closure of Building 776 by storing its remaining material. The need for access to NDT instrumentation presently on the ground floor for 3013 packages, and the complexity of relocating the IAEA vault are additional considerations. Thus, the commitment to perform the evaluation does not prejudice the answer since adverse impacts must be examined and characterized sufficiently to balance them against the risk reduction benefit, which for this particular upgrade applies only for facility collapse events that are considered incredible by some and certainly less probable than 10^{-4} /year.

Table 6-2. Interim Storage Upgrade Validation		
Upgrade	Upgrade Type	Validation Requirements
60K Gallon Water Tank	App. C -- Safety Margin	Assess whether combustible control for interim storage conditions makes this upgrade unnecessary; if not, tie implementation timing to fire department closure
Upgrade EP and EOPs	App. C -- Safety Margin	Verify that BIO-implementation lays groundwork for annual upgrades eliminating this future project
Plenum Deluge Recharge	App. C -- Safety Margin	Cancel if scrubber removal is a more effective means of ensuring safety
Remote Control Stations	App. C -- Safety Margin	Evaluate scope of required ventilation given vault and material locations; determine most effective implementation strategy
Seismic Dry Standpipes	App. C -- Safety Margin	Assess whether combustible control for interim storage conditions makes this upgrade unnecessary; if not, tie implementation timing to fire department closure
300 kw Standby Generators	App. C -- Safety Margin	Evaluate minimum scope given vault and material locations; determine most effective implementation strategy
Upgrade 1101 & 1208 Ceiling	App. C – Material Relocation	Verify that ceiling strengthening can follow material loading in vault below
Ground Floor Vault HVAC	App. C – Material Relocation	Update status of expected temperatures and safety significance of 100 degree centigrade limit for stored metals per STD-3013
Reconfigure Sub-Basement Vaults	App. C – Material Relocation	Evaluate practicality of early start for oxides in sub-basement vs. completion in time for start of interim storage
Convert 3559 & 3561 to Vaults	App. C – Material Relocation	Verify the pit shipment schedule makes these upgrades unnecessary
Security Cages on Roof Doors	App. C – Security *	Verify that security cages like PIDAS reduction can be decoupled from start of interim storage
Reduce PIDAS	App. C – Security *	Verify decoupling PIDAS schedule from start of interim storage
Upgrade 3606 Roof	App. C – Security *	Determine mission for 3606 vault for interim storage (e.g. contingency for HEU) and tie upgrade to mission
Material Transfer Dumbwaiter	App. C – Priority Non-Safety	Tie to material relocation and reassess need for frequent material transfers between floors
Assess Scrubber Removal	AB Required Study	Verify that removal prior to interim storage is more effective than deluge recharge piping (i.e., affords prevention vs. mitigation and improves non-earthquake safety as well)
Further Mitigate Dock Fire	AB Review Report App. B	During required review, assess whether new upgrades emerge that warrant completion for safe interim storage
Further Mitigate Dock Drum Explosion	AB Review Report App. B	During required review, assess whether new upgrades emerge that warrant completion for safe interim storage
Further Mitigate EBE	AB Review Report App. B	During required review, assess whether new upgrades emerge that warrant completion for safe interim storage

* The security upgrades are not the subject of Recommendation 94-3 and are only provided to present a complete list of upgrades possible for an interim storage mission.

6.4 Execution

For each function identified in Table 6-1, the required activities are focused at Rocky Flats and include the following scopes:

1. **Design, construct, or otherwise implement the validated upgrades on a firm schedule to support completion by 2002** – Complete upgrade design, providing a firm basis for scheduling procurement of long lead material and construction on a schedule that will ensure completion by 2002. Implementation, when scheduled, shall be managed using Site project management procedures for construction upgrades. Non-construction upgrades (e.g., revisions to the Emergency Plan) shall be implemented using Site processes. Detailed design and construction of the physical upgrades shall be accomplished based on identified system functional requirements. Testing and acceptance plans shall be performed as required to ensure functionality.

The above plan is designed to assure with high confidence that the validated Interim Storage upgrades are completed by 2002. Construction to implement the upgrades is delayed, however, relative to the schedule in the original IPP for the following reasons:

- Appropriate progress on Building 371 material storage risk reduction is being made in FY98 with: completion of the Priority upgrades, design and construction of the twenty-one BIO-identified upgrades, implementation of the BIO, preparation for material stabilization and packaging, and the validation of Interim Storage upgrades. Note that the 94-1 Program packaging for SNM and residues will provide a steady reduction in risk and increase in safety margin once processing is underway. Plutonium metal and oxide will be packaged in DOE-STD-3013 compliant containers. Dispersible residues will be placed in the POCs. These sturdy containers provide significant defense-in-depth toward the goal of preventing material release in earthquake or fire scenarios.
 - The actual construction schedule, which will be developed as designs are completed, will be an integrated schedule that involves realistic estimates of productivity and sustainable levels of activity in Building 371 based on recent experience. The projects will be scheduled appropriately to ensure that they will be completed by 2002.
2. **Revise the AB for the interim storage mission** – the AB for the interim storage mission shall be upgraded to a SAR and revised to reflect the facility configuration and those activities planned during interim storage. The revised AB shall otherwise meet the applicable criteria for an effective AB for sub-recommendations 2 and 6 (Section 2, Completion of DNFSB 94-3 Sub-Recommendations). Preparation will begin in FY 2000, well before the expected start of the interim storage mission. This starting time should still be late enough to afford a reasonably accurate perspective on facility configuration and activities. The revised AB will test the sufficiency of the validated Interim Storage upgrades and may identify some additional upgrades needed to implement effective controls. The validation process is being planned to minimize this risk; however, should additional upgrades prove necessary, they will be scheduled for prompt implementation. The contractors preparing the SAR will begin with a program plan submitted for RFFO review to obtain early consensus on the scope and approach.

6.5 Operation

Conduct of interim storage operating activities will be subject to appropriate controls in accordance with the SAR; these controls will ensure activities are conducted consistent with Integrated Safety Management.

6.6 Closure

Facility deactivation will be addressed by an update to the AB document prior to implementing deactivation activities. The deactivation will be coordinated with the Site Closure Project through Site closure and annual work plans.

6.7 Contingencies

The principal contingency affecting the facility mission involves the demonstration that the Department's preferred off-site option is sufficiently certain to permit work on interim storage to be discontinued. Accordingly, Go/No Go criteria have been developed for the off-site option and are reflected in deliverable 6-5 below. If an alternative to storage in APSF is selected, as discussed in Section 5.7, the Department will inform the Board, and provide appropriately revised Go/No Go criteria, through the quarterly report.

Validation of upgrades in FY98 for a mission to begin in 2002 necessarily involves judgments about future events that may differ from current expectations. To address this, each validation judgment will document key assumptions significant to the success of the required safety function. Additionally, if the AB for interim storage is developed, it will require that the capability to perform required functions be demonstrated. Thus, any disconnects that may develop will be identified and addressed. This approach will preclude, for example, a validation decision premised on a degree of combustible control that is later not realized.

6.8 Deliverable Summary for Building 371 Contingency (2002-2015)

- 6-1. Complete validation assessments for the Interim Storage upgrades (those that are not "Priority" in Appendix C), including a schedule for design engineering to be performed in FY99, documented, and reported by August 1998. Provide the plan for the validation effort to the Board by March 1998.
- 6-2. Complete design of validated upgrades by September 1999, including a construction/implementation schedule which ensures completion by 2002.
- 6-3. Complete construction and implementation of validated upgrades by 2002 in accordance with the September 1999 schedule (6-2 above).
- 6-4. Begin AB revision in SAR form for interim storage mission in FY 2000 and complete implementation in 2002.
- 6-5. Assess the following "Go/No Go" criteria for assured success of off-site shipment in Section 5 and report when they are satisfied:
 1. APSF construction is funded and underway with sufficient storage capacity committed to RFETS material or alternate acceptable storage off-site is authorized, funded, committed for storing RFETS material, and construction is underway.
 2. The ROD for a plutonium disposition site is issued and identifies SRS as a disposition site or the MD PEIS ROD is amended to delete this condition as a requirement for receipt of RFETS material and any alternative NEPA requirements are fulfilled.
 3. The PuSPS at Rocky Flats is operational and authorized to begin material stabilization and packaging or the Department has established firm plans for packaging to be performed off-site.
 4. A shipment of plutonium-bearing materials from RFETS to SRS in SSTs has been successfully completed; specific plans are in place to provide for future shipments.
 5. Adequate assurance is provided that off-site pit shipments are on schedule for completion by the end of FY99.

When the Go/No Go criteria are satisfied, all remaining work (including design, construction, or other implementation) on the validated upgrades and the SAR to establish the Building 371 interim storage option may be discontinued by the Department. The Department will formally notify the Board before the upgrades are discontinued.

- 6-6. Monitor and report via the quarterly report progress on off-site shipment, including APSF construction or suitable alternative. If delays are identified that jeopardize material transfer beginning in 2002, the

Department will formally notify the Board and propose appropriate action which may include resumption of work on Interim Storage upgrades and the SAR.

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42. Kaiser-Hill L.L.C., Basis for Interim Operation Building 371/374 Complex, Revision 2, September 10, 1997, and including Appendix, Technical Safety Requirements for the Building 371/374 Complex BIO, Revision 2
43. USDOE, Rocky Flats Field Office, Review Report for Basis for Interim Operation Building 371/374 Complex, Revision 2, September 10, 1997
44. Rocky Flats Environmental Technology Site, Building 371/374 Complex Authorization Agreement, Authorization Agreement No. RFETS-005, September 11, 1997
45. Safe Sites of Colorado, Basis for Interim Operation Implementation Plan Building 371/374 Complex, BIO-IP, Revision 1, October 30, 1997
46. U. S. Department of Energy, Record of Decision for the Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement, January 14, 1997
47. Rocky Flats Environmental Technology Site, Accelerating Cleanup: Focus on 2006 Discussion Draft, Volume I, June 1997
48. Kaiser-Hill L.L.C., Basis for Interim Operation Building 371/374 Complex System Evaluation Report, Revision 0, July 16, 1997
49. Kaiser-Hill L.L.C., Defense Nuclear Facilities Safety Board Recommendation 94-3 Integrated Program Plan, Deliverable 4-1, "Evaluate and select Material Management Alternatives for 'High Dispersibility' Residues", April 2, 1997
50. Kaiser-Hill L.L.C., Evaluation of Pipe Overpack Containers for TRU Waste Storage, Revision 001-97, April 1, 1997
51. Rocky Flats Cleanup Agreement, signed by the U.S. Department of Energy and the Environmental Protection Agency and the State of Colorado, July 19, 1996
52. Defense Nuclear Facilities Safety Board Recommendation 94-1.

Appendix A. Executive Summary from Original IPP (Revision G, July 1996)

The Defense Nuclear Facilities Safety Board (Board) issued Recommendation 94-3 to address potential deficiencies in the capability of the Rocky Flats Environmental Technology Site's (Site's) Building 371 to perform its new plutonium consolidation mission. The Recommendation was based upon the Department of Energy (Department) position at the time that Building 371 would be the Site's plutonium storage facility until off-site shipment (estimated as 2010 - 2015). The Board had particular interest in the capacity of Building 371 to provide reasonable assurance of protection of public and worker health and safety should it be subjected to external forces from natural phenomena, especially earthquakes. The Department accepted the Board's Recommendation and committed to a phased approach to respond to the eight sub-recommendations. The Department submitted an Implementation Plan (IP) for Phase I to the Board in June 1995 with a commitment to develop an Integrated Program Plan (IPP).

The purpose of Phase I (June through November 1995) was to determine whether Building 371 was suited for the plutonium storage mission, and what actions, would be necessary to make it suitable. The studies concluded that, with upgrades identified during Phase I, Building 371 would be satisfactory for the storage mission. However, a new storage vault, which could be available by 2002, emerged as a superior alternative in terms of reliability and cost. The new ISV would also provide increased safety and security margin since the ISV would be constructed using later, more stringent requirements. In November 1995, the Department decided to defer the Phase II IPP and to analyze further both a new Interim Storage Vault (ISV) and an upgraded Building 371 in order to identify a preferred interim storage approach by March 1996. The Department also recognized the need to ensure the safety of Building 371 for its mission regardless of the interim storage facility decision. Further, it became apparent through the Phase I risk analyses that there was a need to ensure safe storage of the Site's more dispersible plutonium residues. Thus, these two objectives became a part of the Recommendation 94-3 response program at the end of Phase I.

To assure that Building 371 will adequately perform its mission, the Department will implement the following actions:

- Immediately proceed with priority upgrades to Building 371 which the Department believes are needed to ensure protection of public and worker safety.
- Expedite development of an updated Authorization Basis for safe operation of Building 371. The Authorization Basis is to be based on a facility hazards analysis supplemented by process hazards analyses.
- Based on the Authorization Basis, identify those structures, systems, components (SSCs) and programs which provide a safety function. These SSCs and programs will be evaluated to ensure functional adequacy for performance of the building mission. Upgrades needed to provide functional adequacy will be identified and scheduled for near-term completion.

In January 1996, further studies were defined and initiated to support the selection of a preferred approach for the interim storage facility (i.e., ISV versus an upgraded Building 371 for the period estimated from 2002 through no later than 2015). To support the life-cycle comparison of the two alternatives, these studies identified priority upgrades for Building 371 to be implemented promptly and unconditionally and reaffirmed the suitability of an upgraded Building 371 to provide safe interim storage. These studies also confirmed advantages for a new passive vault with respect to cost, safety and security margins, and ease of implementation. Based on the results of these studies, the Department decided on March 18, 1996 to: proceed immediately with the priority upgrades to support the near-term Building 371 consolidation mission through 2002; proceed with a formal decision process to analyze the interim storage alternatives;¹ and move forward

¹ As part of this process, the Department is required to analyze the interim storage alternatives in accordance with the National Environmental Policy Act (NEPA).

on the predecisional design for a new ISV for the interim storage mission. These studies, however, did not establish a new plan to manage the more dispersible residues safely.

The post-March 18, 1996 actions described in this IPP provide the basis for the Department's formal, Phase II Recommendation 94-3 response to the Board.¹

While the Department is considering an ISV for the interim storage mission many factors outside the Department's control may influence construction of an ISV. Accordingly, this IPP commits to implementation of necessary upgrades on a phased schedule to be deferred only if an ISV (or offsite shipment) is confirmed to support the IPP goals below.

This IPP has two major goals that the Department established to affirm the Board's statement in its' March 13, 1996 letter to Acting Under Secretary Grumbly, "The fundamental tenet of Recommendation 94-3 was to ensure safe storage of SNM at RFETS":

- Goal 1: Establish safe operation of Building 371 in conformance with an updated Authorization Basis (AB); and**
- Goal 2: Reduce the incremental Site risk from interim storage of SNM to a level that is a small fraction of that due to current plutonium holdup in the Site's buildings (See Figure 1)**

This IPP has the following objectives to ensure that these goals are realized:

Goal 1 Objectives

- *Fully address the eight sub-recommendations contained in Recommendation 94-3 for the mission of Building 371. (Section 2).*
- *Provide an updated Building 371 AB, complete definition and implementation of necessary safety upgrades in Building 371, and establish building operations in conformance with the updated AB (Section 3).*

Goal 2 Objectives

- *Ensure an integrated Site plan for safe plutonium management and storage based on systems engineering principles. The insights gained on the overall Site risk from residues and the effects of the decision to proceed with the priority Building 371 upgrades and predecisional design for a new ISV are to be integrated with the actions previously committed by the Department in response to Recommendation 94-1. Systems engineering principles will be applied to provide safe residue storage and shipment that incorporates contingencies, such as possible delays in the Waste Isolation Pilot Plant (WIPP) opening (Section 4).*
- *Prepare Building 371 for safe interim storage of the Site's plutonium metal and oxide or provide an acceptable alternative by 2002. Either off-site shipment or construction of the ISV in time to allow*

¹ Per the June 1995 Implementation Plan (IP), the Department committed to the Board to formally transmit an Integrated Program Plan (IPP) that implements the Department's decision on interim storage (deliverable 11-2). This document [i.e., Revision G, July 1996] is intended to fulfill that commitment.

storage of SNM by 2002 could be acceptable alternatives to a completely upgraded Building 371 (Sections 5 and 6).

Broadly, the Department has elected to use this IPP both as a strategic planning tool to ensure safe interim storage of the Site's plutonium and as the vehicle to drive implementation of those aspects of the strategy not appropriate for inclusion in the Recommendation 94-1 response plan (Site Integrated Stabilization Management Plan [SISMP]). This election reflects the experience to date with the application of systems engineering principles to the selection of a preferred alternative for the interim storage facility.

This IPP establishes clear missions related to each objective listed above, establishes functional requirements to implement these missions, and then selects and pursues a preferred alternative for achievement. Also, this IPP identifies and will monitor contingent circumstances that may jeopardize the prospects for the preferred alternative to successfully fulfill those missions. The Department's assessment of current circumstances at the Site is that only such a flexible approach can maximize the likelihood of success, since all promising alternatives depend upon external or otherwise difficult to control factors.

Overall, this plan will ensure the safe operation of Building 371 originally sought by Recommendation 94-3 and, more broadly, the safe interim storage of the Site's plutonium inventory.

Appendix B. Recommendation 94-3 Phase II Schedule

(Dates Are Calendar Years)

M/S #	RFETS DELIVERABLES	DATE	1998				1999				2000				2001				2002			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
3-2	Complete final three Priority Safety upgrades	July 1998	██████████																			
3-3	Establish Building 371 operation per new AB	August 1, 1998	██████████																			
3-4	Complete AB-required upgrades	October 1998	██████████																			
4-3	Establish safe interim storage of SNM and residues	December 2002													██████████							
6-1a	Complete validation plan for interim storage upgrades	March 1998	██████████																			
6-1b	Complete validation for interim storage upgrades	August 1998	██████████																			
6-2	Complete design for interim storage upgrades	September 1999					██████████															
6-3	Complete construction/implementation of validated upgrades	December 2002													██████████							
6-4a	Begin AB revision for interim storage	During FY-2000								X											
6-4b	Complete implementation of interim storage AB	December 2002													██████████							
6-5	Assess Go/No Go criteria and report when met	After Jan. 1999																				
6-6	Monitor for significant delay after Go/No Go met	Through Dec. 2001																				

M/S #	COORDINATED DELIVERABLES FROM COMPLEX TO SUPPORT RFETS SNM OFF-SITE SHIPMENT	DATE	1998				1999				2000				2001				2002				2003				2004			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
5-1	ISSUE ROD for Pu IMMOBILIZATION SITE	February 1999	█																											
5-2	PREPARE APSF FOR RECEIPT OF RFETS SNM																													
a.	Complete APSF Design	August 1998	█																											
b.	Construct APSF	Oct. 98 - Mar. 01					█																							
c.	Startup APSF	Apr. 01 - Oct. 01									█																			
5-3	PREPARE FOR AND TRANSPORT SNM OFF-SITE																													
a.	Complete Pit Off-Site Shipments	September 1999	█																											
b.	Demonstrate Material Shipment to SRS	June 1998					X																							
c.	Procure Containers (9975s) Needed for Shipment	Oct. 98 - Sep. 00					█																							
d.	Transport SNM Off-Site	Oct. 01 - Sep. 04													█															

Appendix C. Building 371 Upgrades

Project Description	Upgrade Group
• Repair of Construction Line "T" Joint -- Repair joint and upgrade HVAC seismic supports near HVAC Systems 1 & 2 Bypass Valves	Priority - Safety
• Filter Plenum Demister Analysis and Inspections	Priority - Safety
• Penetrations for Room 3206 Fire Wall -- (DOE Standard 3013 Repackaging Room)	Priority - Safety
• Combustible Loading Control Program (CLCP)	Priority - Safety
• Seismic HVAC Upgrades -- Plenum and Fan Seismic Structural Support Upgrades	Priority - Safety
• Fire Doors -- Repair and/or Replace Facility Fire Doors	Priority - Safety
• Subsurface Drain System -- Develop inspection procedures, perform drain inspections, and engineered plan defining actions on loss of drain system	Priority - Safety
• Resolve HVAC Supply Isolation Capability -- Complete evaluation of HEPA filtration option and implement HEPA filtration or alternative using isolation valve	Priority - Safety
• Plenum Deluge System Modifications, backup N2 supply and valve redesign	Priority - Safety
• Egress Route Upgrades -- Remove stairwell crash bars, signs, etc.	Priority - Safety
• Life Safety Code Exemption -- Prepare exemption for egress routes not in compliance to the Life Safety Code	Priority - Safety
• Basement Level Fire Walls -- Upgrade basement walls to NFPA criteria for protection of HEPA filters	Priority - Safety
• Seismic Bracing for Attic Water Pipes	Priority - Safety
• Relocate high risk residues in Room 3189	Priority - Safety
• Implement S/R Load Limits	Priority - Safety
• Replace Cooling Tower	Priority - Non-Safety
• Material Transfer Dumbwaiter -- Ground Floor to Subbasement Levels	Priority - Non-Safety
• Structure -- Upgrade ceiling for new sub-basement storage vaults (Rooms 1101 & 1208)	Material Relocation
• Fire Suppression -- Install 60K Gallon Seismic Water Tank	Safety Margin
• Program -- Upgrade Emergency Plan and Emergency Operating Procedures	Safety Margin
• Fire Suppression -- Install seismically qualified plenum deluge system recharge piping	Safety Margin
• Control -- Install two remote control stations for primary fans and standby generators	Safety Margin
• Fire Suppression -- Install seismically qualified dry standpipes	Safety Margin
• Power -- Install 300 kW standby electric generation for primary HVAC fans	Safety Margin
• HVAC 1 & 2 -- Install standby supply air fans to cool ground floor vaults	Material Relocation
• Structure -- Install security cages on roof doors	Security
• Structure -- Reconfigure sub-basement SNM storage vaults; include localized security upgrades	Material Relocation
• Security -- Reduce Perimeter Intrusion Detection and Alarm System to Building 371 only	Security
• Structure -- Convert Rooms 3559 and 3561 to SNM storage vaults	Material Relocation
• Structure -- Upgrade Room 3606 Roof	Security