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Plan of Action To Resolve Spent Nuclear Fuel Vulnerabilities

Phase I

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Executive Summary

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Foreword

This report presents the first phase of a three-phased approach to remedy vulnerabilities associated with the storage of spent fuel and irradiated materials. It demonstrates the "openness" the Department of Energy is pursuing as part of its new way of doing business. In an intense two month effort, technical experts have characterized and evaluated the findings of the *Spent Fuel Working Group Report*, and developed and begun implementing corrective actions.

This first phase describes those action plans which have been completed or for which no major funding or policy issues exist. Of the 106 vulnerabilities identified, 33 require priority management attention. The Phase I Plan addresses 31 of the 33 high priority vulnerabilities and 48 of the lower priority issues; many of these corrective actions are underway. The remaining vulnerabilities will be addressed in Phases II and III. In all cases, the Department is taking actions to address the goals of minimizing worker exposure, reducing environmental risk, and safeguarding the public.

The Phase II report is scheduled to be issued in April 1994. In this update, it is our goal to resolve issues related to the level and source of funding for those activities not addressed in Phase I. When Phase III is issued in September 1994, we expect to have resolved a number of critical policy issues to the extent that a finalized plan of action can be developed. The particularly difficult policy issues facing the Department are: a) What is the path forward for geologic disposal of spent nuclear fuel? b) Should new interim storage and conditioning facilities be licensed by the Nuclear Regulatory Commission? c) Should Hanford N-Reactor fuel be stored in a dry configuration? and d) What should the approach be if some DOE-owned spent fuel is deemed unsuitable for extended interim, dry storage or direct geologic disposal?

The challenge before us now is to sustain the momentum developed in resolving these vulnerabilities. In this endeavor, we are soliciting public participation to accomplish our shared goals.

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Assistant Secretary
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Background

In August of 1993 Secretary O'Leary commissioned a comprehensive baseline assessment of the environmental, safety, and health vulnerabilities associated with the storage of spent nuclear fuel in the DOE complex. During October 1993, a multi-disciplinary Spent Fuel Working Group, directed by the Assistant Secretary for Environment, Safety and Health, and comprised of DOE employees and contractors, assessed 66 facilities spread across 11 sites. This assessment was performed to determine the inventory and the condition of the Department's Reactor Irradiated Nuclear Material, which includes spent nuclear fuel and reactor irradiated target material. The assessment also evaluated the condition of the facilities that store spent fuel and identified the vulnerabilities and problems that are currently associated with these facilities.

Based on this evaluation process, a report to the Secretary, entitled *Spent Fuel Working Group Report on Inventory and Storage of the Department's Spent Nuclear Fuel and other Reactor Irradiated Nuclear Materials and Their Environmental, Safety and Health Vulnerabilities* ("The Working Group Report," Volumes I, II, and III), was released to the public on December 7, 1993.

What Are Vulnerabilities?

Vulnerabilities in nuclear facilities are conditions or weaknesses that may lead to radiation exposure to the public, unnecessary or increased exposure to the workers, or release of radioactive materials to the environment. For example, some DOE facilities have had leakage from spent fuel storage pools, excessive corrosion of fuel causing increased radiation levels in the pool, or degradation of handling systems. Vulnerabilities are also caused by loss of institutional controls, such as cessation of facility funding or reductions in facility maintenance and control.

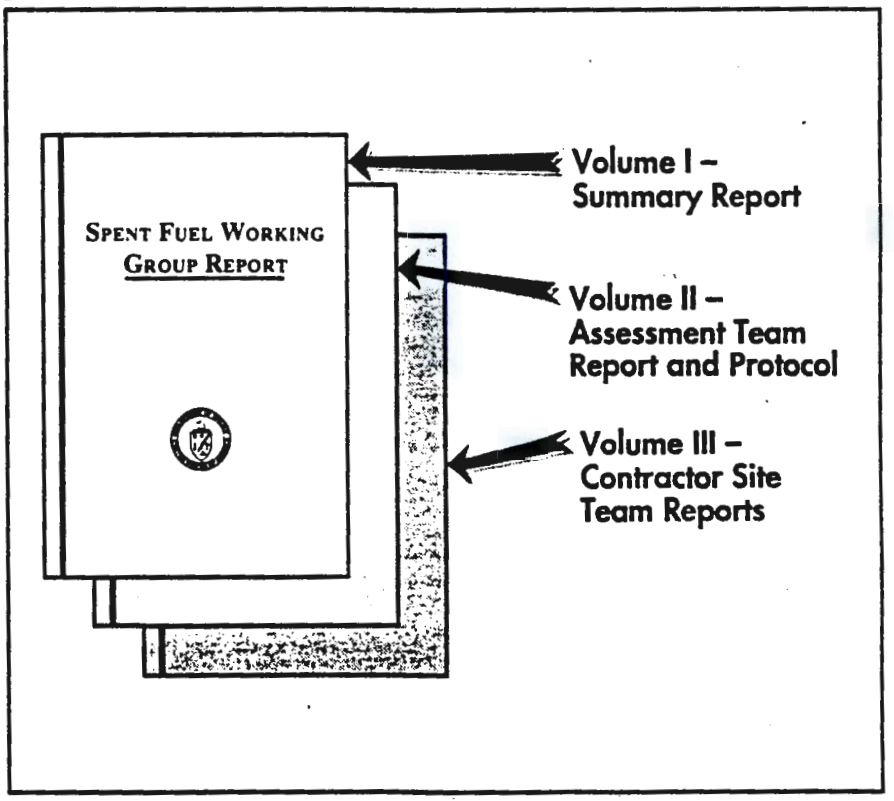


Figure 1. The Reports of the Spent Fuel Working Group convey findings on vulnerabilities, programmatic issues, and facilities requiring priority attention.

Scope of the Problem — Overall Plan of Action

The Working Group Report released in December 1993 identified a total of 105 vulnerabilities associated with the Department's spent nuclear fuel storage facilities. Subsequent to issuance of the report, a potential vulnerability was identified related to buried fuel at the Savannah River Site, bringing the total number of vulnerabilities to 106. All 106 identified vulnerabilities are listed in Attachment A to this Executive Summary. Eight facilities with major vulnerabilities were identified in the Working Group Report for which priority management attention was recommended. Volume II of the Working Group Report categorized all other identified vulnerabilities based on the time frame during which it was recommended that the vulnerability be addressed: less than one year, one to five years, and greater than five years. Volume II of the Plan of Action contains a detailed explanation of the prioritization process and presents individual action plans to address specific vulnerabilities.

Since issuance of the Working Group Report, a comprehensive effort has been underway to develop a finalized Plan of Action to address all vulnerabilities, taking into consideration currently available resources. For a number of the vulnerabilities, substantial unresolved issues have been determined to exist in the areas of funding availability and critical policy decisions. These issues have delayed near-term formulation of complete Action Plans to resolve all the individual vulnerabilities. Accordingly, it was decided that the overall Plan of Action would be developed using a phased approach and updated as programmatic decisions were made.

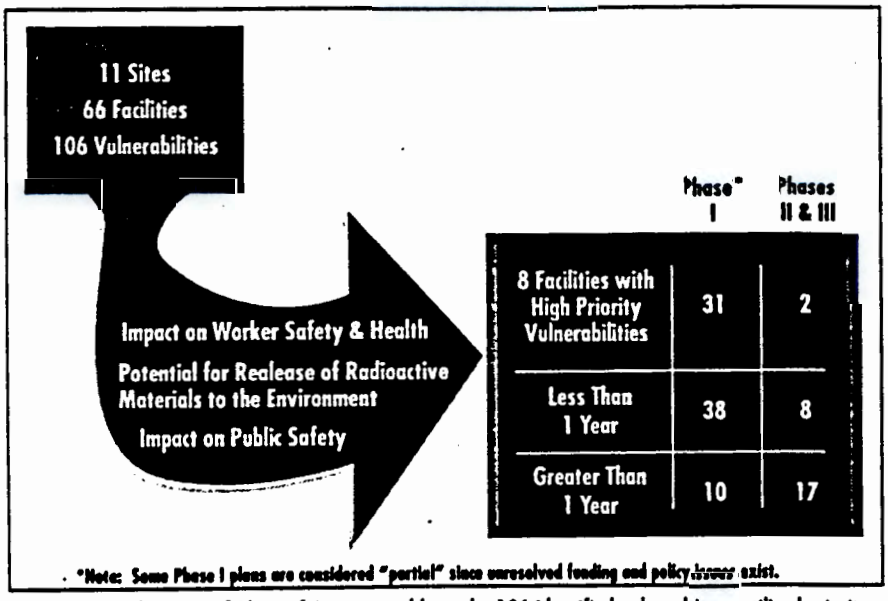


Figure 2. Development of Plans of Action to address the 106 identified vulnerabilities utilized priority ranking criteria and a phased approach.

The Phased Approach to Plan Formulation

Goals For Developing Plans Of Action

- ***Sense of urgency***
- ***Concern for worker protection***
- ***Commitment to mitigate environmental impacts***
- ***Need for compatible long-term solutions***

The Plan of Action consists of a consolidation of individual action plans designed to address each of the identified vulnerabilities in a manner that reflects DOE's

- sense of urgency
- concern for worker protection
- commitment to mitigate environmental impacts
- need for compatible long-term solutions.

Actions are underway at all sites to improve the management of spent nuclear fuel and irradiated nuclear materials. However, due to outstanding policy and funding issues, a number of individual action plans cannot be finalized in the near term. Therefore, the Plan of Action will be issued in three phases, this report being Phase I. The two updated reports (Phase II and III) will reflect subsequent decisions made to resolve the outstanding issues.

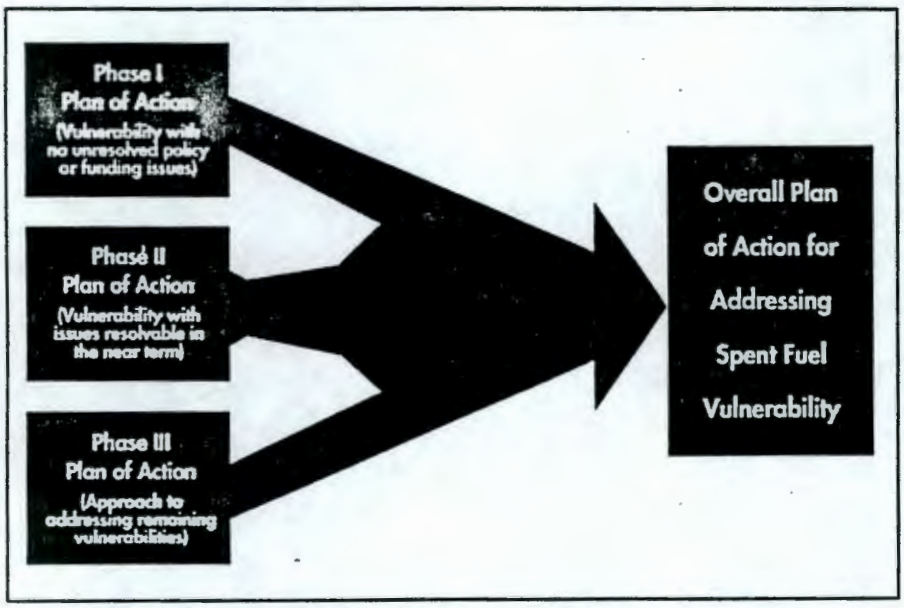


Figure 3. The Plan of Action for addressing spent fuel vulnerabilities will be phased with the resolution of outstanding programmatic and funding issues.

Phase I - This Phase I Plan of Action includes those facility action plans for which no major outstanding policy or funding issues exist. For these individual action plans, general agreement already exists on the necessary actions and the availability of funding. Of the 106 vulnerabilities identified, 33 have been determined to require priority management attention. The Phase I submittal addresses 31 of these 33 high priority vulnerabilities and 48 of the lower priority issues. The remaining vulnerabilities will be addressed in Phases II and III. The Department is actively seeking input from stakeholders on the Phase I report.

Phase II - In April 1994, the first update to the Plan of Action will be issued. During the four- to six-week period following issuance of the Phase I Plan of Action, the major focus will be to resolve the outstanding funding issues. This update will include those individual action plans that can be developed based on the resolution of the outstanding funding issues and will also reflect, to the extent possible, stakeholder feedback received on the Phase I Plan of Action.

Phase III - In September 1994, a second updated Plan of Action will be issued. The second update will include the development of an approach to fully address the remaining vulnerabilities, i.e., those vulnerabilities not addressed in Phases I and II. This update will focus on the resolution of the critical policy issues: 1) the path forward for geologic disposal of the spent nuclear fuel; 2) the adoption of Nuclear Regulatory Commission licensing and commercial industry standards for new interim storage and conditioning facilities; 3) options for dry storage of N-reactor fuel at Hanford; and 4) the approach to be taken if some DOE-owned SNF is deemed unsuitable for extended interim dry storage or direct geologic disposal and thus requires spent fuel dissolution or processing (e.g., at F & H canyons at Savannah River). The update will include stakeholder feedback received on the original Plan of Action and the first update.

Eight Facilities With Major Vulnerabilities

Eight facilities were identified by the Working Group as having major vulnerabilities. These facilities are listed below and shown on Figure 4.

Site	Facility
Hanford	• *K East Basin* • *PUREX Canyon* • *200 West Area Burial Grounds*
Savannah River	• *L-Reactor Disassembly Basin* • *K-Reactor Disassembly Basin*
Oak Ridge	• *Classified Burial Ground** • *HRE Disposal Wells*
Idaho National Engineering Laboratory	• *CPP-603 Fuel Storage Facility*

* *Subsequently, this material was found to be located in Solid Waste Storage Areas 5 and 6*

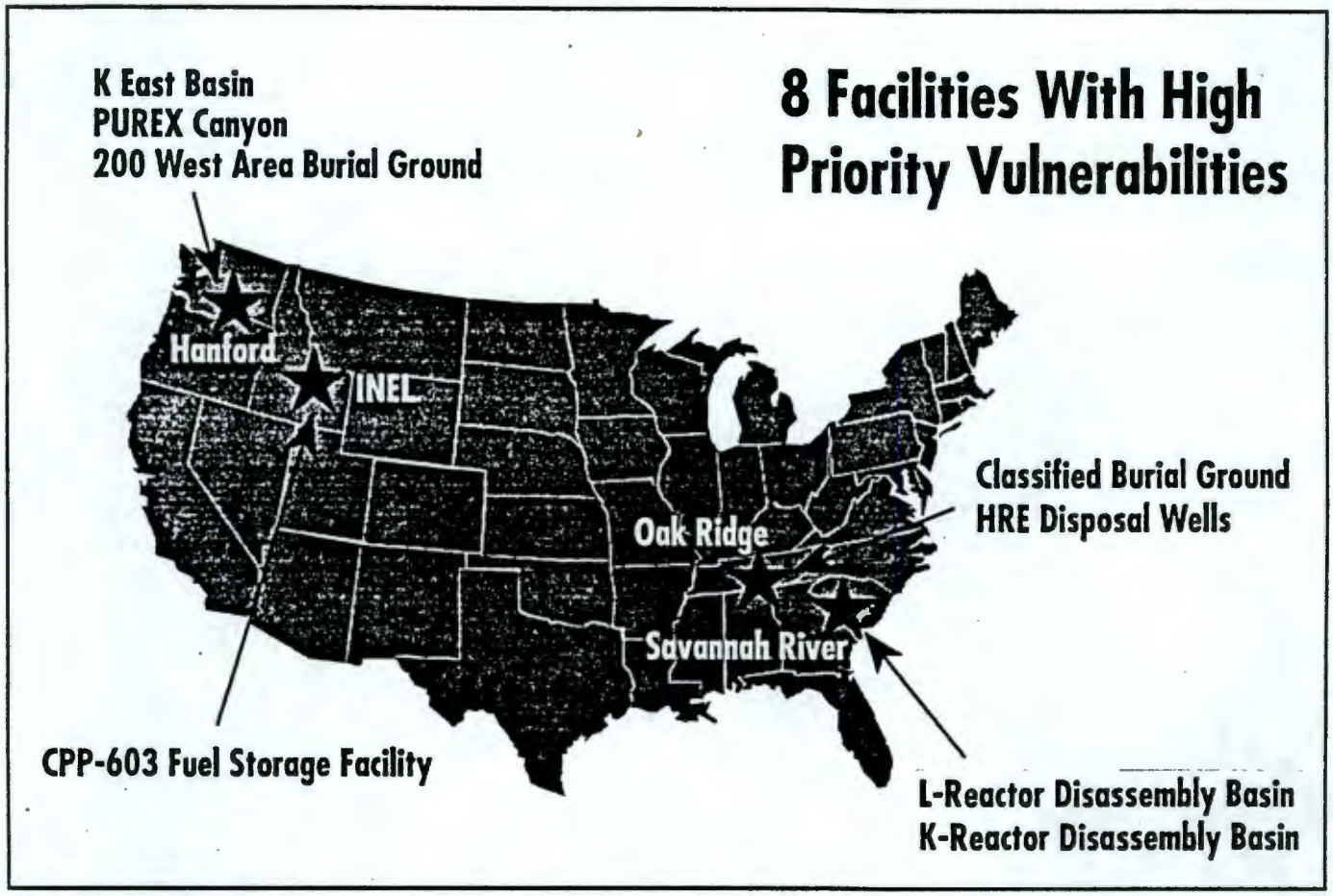


Figure 4. Eight facilities were identified by the Working Group as having major vulnerabilities which demand immediate attention.

Criteria For Identifying Priority Facilities

- *Inventory: The quantity of Reactor Irradiated Nuclear Material (RINM) in residence at the facility at the time of review.*
- *Barriers to Release: The condition of the barriers that prevent the release of RINM, and actual or potential migration of RINM.*
- *Uncertain Conditions: Those conditions where lack of information or knowledge creates difficulties in establishing the appropriate corrective actions.*
- *Design: The original design of the facility is inadequate when compared to the current requirements or use of the facility.*

Selection of these facilities for priority attention was based on application of the ranking criteria listed above.

Five Common Fundamental or Generic Issues

In addition to the specific site vulnerabilities, the Working Group identified five fundamental (generic) issues that are common to many DOE spent fuel storage facilities. These generic issues will require careful consideration by all facilities during future planning and decision making activities.

Generic Issues Identified By The Working Group

- ***Lack of Approved and Current Authorization Bases***
- ***Seismic Design Inadequacies***
- ***Lack of Programmatic Ownership***
- ***Lack of Complete Material Characterization***
- ***Lack of Specified Path Forward.***

The problems that form the basis for these generic issues were generally known to the Department prior to the issuance of the Working Group Report. In response to the Secretary's direction, the Assistant Secretary for Environmental Restoration and Waste Management initiated the development of the DOE-owned spent nuclear fuel program in 1993. The purpose of the program was to integrate DOE's existing spent fuel activities into one program to better manage reactor irradiated nuclear material and to address known deficiencies.

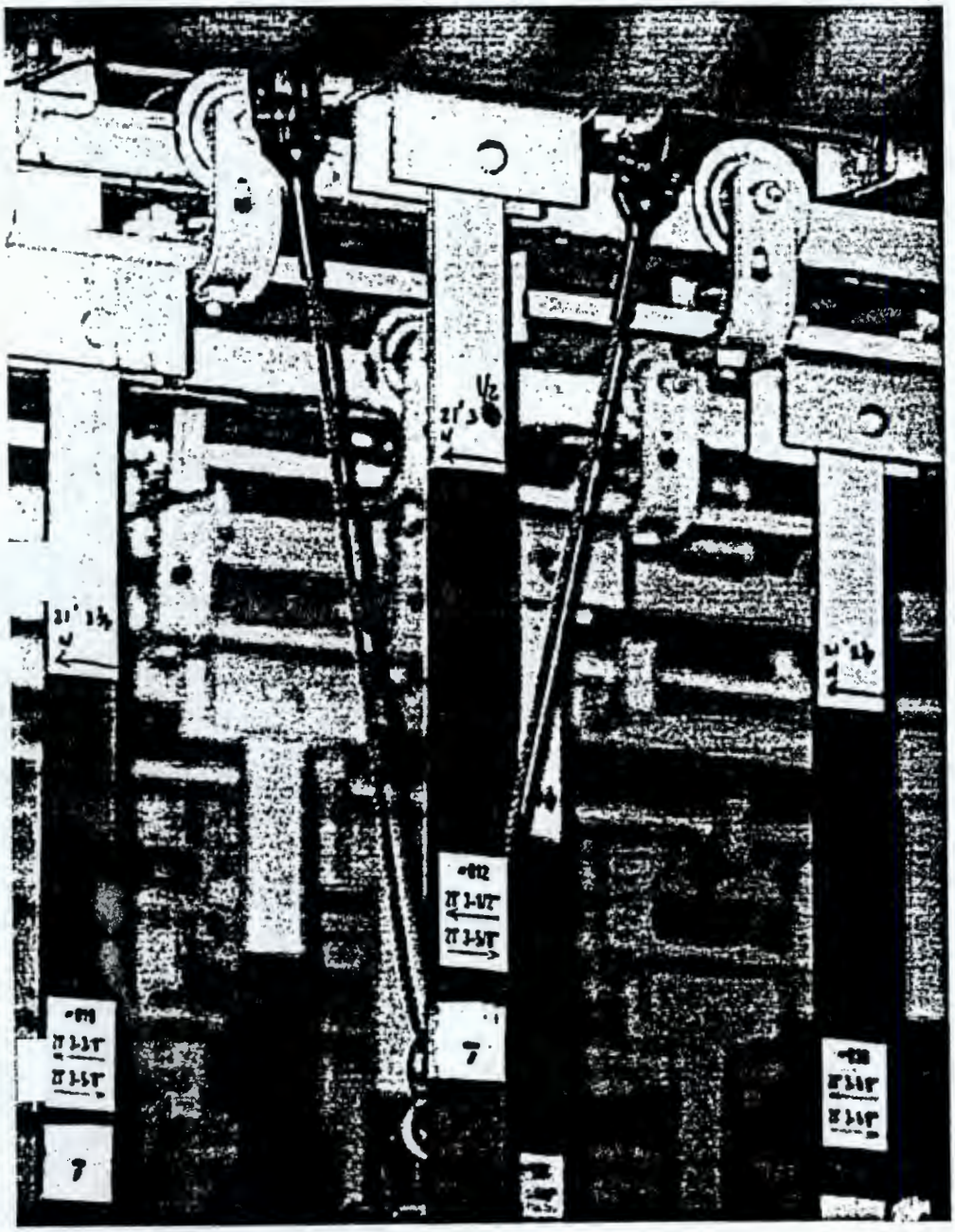
During the formative stages of the program to address DOE-owned spent nuclear fuel problems, schedules were developed and activities initiated to address the known deficiencies. These actions were designed to: address the development of a validated inventory of spent nuclear fuel elements; develop program requirements and an integrated program plan; and formulate a research and development plan based on the performance assessment of spent nuclear fuel in various geologic disposal media.

Activities Already in Progress That Address Identified Vulnerabilities

This Plan of Action is comprised of newly created individual action plans which have been designed to address the identified vulnerabilities. However, in many instances, activities were already in progress that address, at least in part, the vulnerabilities identified by the Working Group. Clearly, however, there are cases in which the current program needed to be expanded or modified to address the vulnerabilities.

For example, at the Idaho National Engineering Laboratory, to correct the excessive corrosion of spent fuel storage at the CPP-603 facility, the following work activities have been either completed, or are underway.

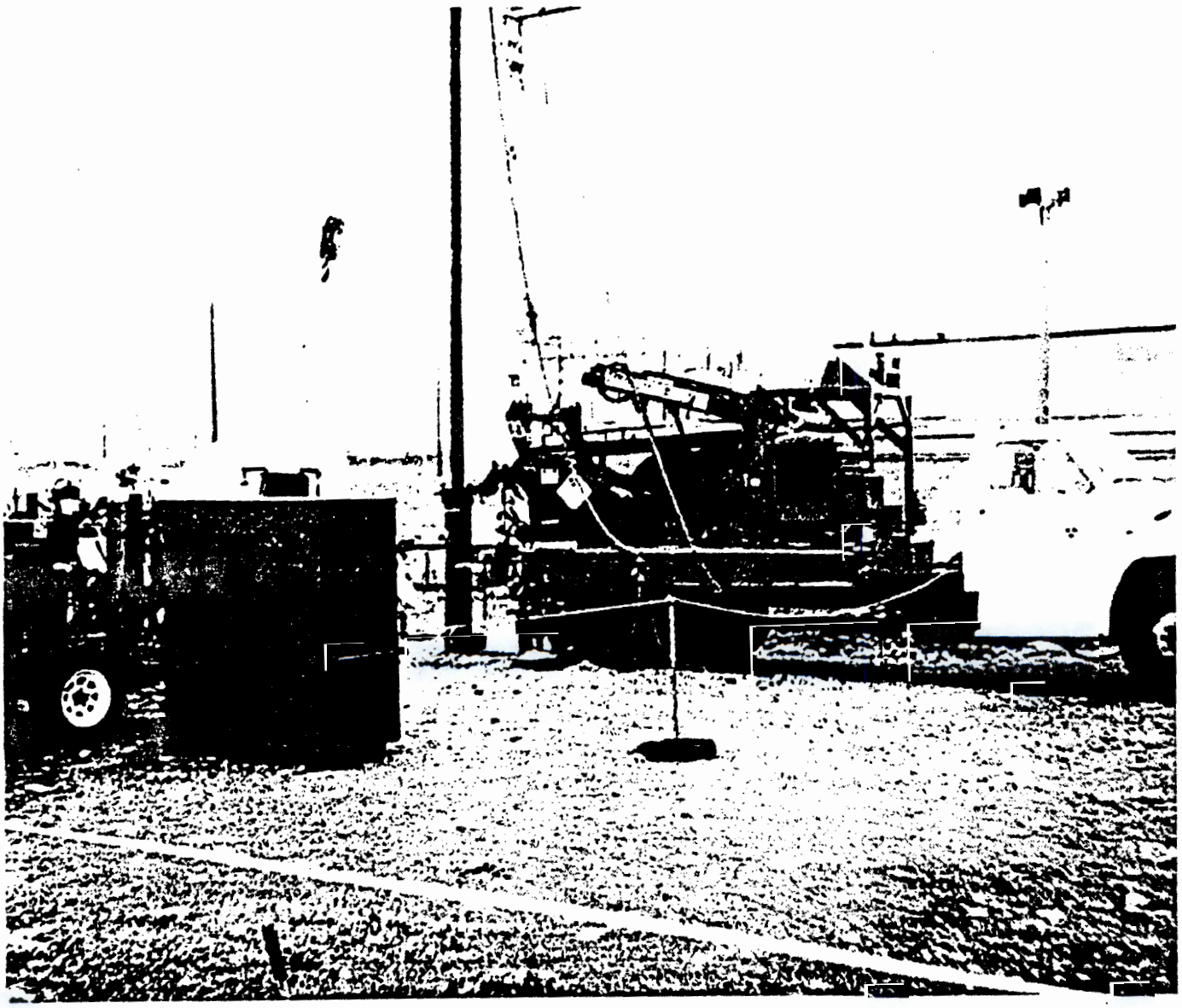
- Completed measurements of the north and middle basin yoke bumpers and corrected any identified problems.
- Installation of redundant stainless steel rigging equipment to prevent additional carbon steel yoke and basket failures.
- Video inspection of storage equipment to determine if the equipment meets required safety standards.
- Transfer of first 189 fuel units to a modern storage facility.
- Install more accurate monitoring equipment to measure potential leakage and institute trending analysis.



Redundant stainless steel rigging equipment will prevent additional yoke and basket failures at the CPP-603 facility at INEL.

At Hanford's K-East Basin, the following activities have been completed, or are in progress.

- DOE, in cooperation with U.S. EPA, the Washington State Department of Ecology, and involved stakeholders, signed a strengthened Tri-Party Agreement addressing cleanup of the 105-K East basin.
- Drilling has begun on three monitoring wells which are being put in place to measure potential tritium migration.
- Sampling and analysis of material in the sandfilter backwash pit is nearing completion. The total plutonium inventory has been determined with reasonable certainty.



Monitoring wells being installed at the Hanford Site will measure potential tritium migration.

Individual Action Plans to Address Vulnerabilities at the Eight Priority Facilities

The corrective action plans for each of the facilities with major vulnerabilities are summarized in this document. Information concerning specific actions, the schedule for such actions, or the funding requirements and status of funding may be found in Volume II.

Hanford Site

K-East Basin. This facility contains approximately 40% of the total DOE spent fuel inventory. Nine vulnerabilities were identified in four areas of concern: corrosion of stored fuel and sludge accumulation; basin leakage with seismic potential for additional leakage; basin water treatment problems; and institutional control failures (lack of planning, frequent organizational and personnel changes, and lack of authorization basis). Seven main objectives have been identified in the action plan: 1) encapsulate the fuel material; 2) minimize worker exposure; 3) mitigate adverse environmental impacts; 4) resolve the safety issue regarding plutonium buildup in the filter backwash pit; 5) update basin water cleanup system to provide acceptable waste forms; 6) characterize the fuel stored in the basin; and 7) define planning priorities for interim disposition of all basin material (fuel and sludge). Activities to support fuel encapsulation are underway in certain portions of the K-East basin. Actual fuel encapsulation is scheduled to begin in or before June 1994 with completion by June 1996. The initiation of the encapsulation process is contingent upon satisfactorily dealing with the issues raised by the Spent Fuel Working Group and the Defense Nuclear Facilities Safety Board (DNFSB) concerning worker safety. Potential changes prior to implementation, if necessary, will be coordinated with and concurred in by the Hanford Tri Party Agreement (TPA) signatories. Removal of the fuel and sludge, and cleanup of the water is to be completed by December 2002.

PUREX (Plutonium-Uranium Extraction). Six vulnerabilities associated with the stored fuel were identified: inadequate fuel pool level monitoring; inaccessibility of fuel for inspection; inadequate support for the four fuel baskets; corroded fuel, baskets, and yoke assemblies; long term storage of nuclear fuel affecting remediation worker safety; and no finalized disposition path forward. In addition, two generic issues were identified as applicable to PUREX: seismic concerns and lack of authorization basis. An action plan has been developed to remove all reactor fuel from its current storage environment in the next two years to allow continued deactivation of PUREX. Pool level monitoring has been changed from quarterly to daily to remove this vulnerability; the other vulnerabilities will be eliminated when all stored fuel has been relocated (approximately two years).

Hanford Site: K-East Basin Action Plan Objectives

- *Encapsulate the fuel material*
- *Minimize worker exposure*
- *Mitigate adverse environmental impacts*
- *Resolve the safety issue regarding plutonium buildup in the filter backwash pit*
- *Update basin water cleanup system to provide acceptable waste forms*
- *Characterize the fuel stored in the basin*
- *Define planning priorities for interim disposition of all basin material (fuel and sludge)*

Hanford Site: PUREX Action Plan Objectives

- *Remove all reactor fuel from its current storage environment in the next two years*
- *Pool level monitoring has been changed from quarterly to daily*
- *Relocate all stored fuel within approximately two years*