

# THE HANFORD SITE: THEN, NOW, AND TOMORROW

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## ABSTRACT

Environmental restoration and waste management have become a primary focus at the 560-square-mile Hanford Site. A schedule has been prepared for cleaning up the approximately 1,100 waste management units and for decontaminating and decommissioning over 100 facilities. The cleanup effort includes the implementation of the Resource Conservation and Recovery Act of 1976 and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as well as technology development and the construction and operation of new facilities.

## INTRODUCTION

The U.S. Department of Energy (DOE) is committed to cleaning up all of the Hanford Site inactive facilities and waste sites within 30 years (by 2018, since some cleanup started in 1988). These wastes will be disposed of safely and permanently. Some of the Hanford Site facilities and waste sites will still be in use in 2018; cleanup of these will occur when they are no longer used.

In order to fully inform the regulators and public of the scope and potential impact of the planned environmental restoration and waste management activities at the Hanford Site, the DOE and its supporting contractors are scoping an overall programmatic environmental impact statement (EIS) that will deal with the entire environmental restoration/remedial action program excluding single-shell tanks (SST), which are dealt with separately. Such an EIS will deal with cumulative impacts of characterization and assessment activities, and will address remedial and corrective actions compared to a baseline of present Hanford Site operations and environmental conditions.

In 1983, the Hanford Site embarked on a journey committed to the cleanup of more than 40 years of accumulated waste. The Hanford Site has come a long way since our last session at Waste Management '85. We are pleased to report today that significant progress has been made in following the DOE's original plans. Ensuing requirements have broadened the scope of those plans significantly. The extent of the waste management and environmental restoration efforts are summarized below.

- Hanford Site -- 560 square miles
- Approximately 1,100 waste management units
- 78 operable units to be investigated
- 55 Resource Conservation and Recovery Act of 1976 (RCRA) treatment, storage and disposal groups (includes 6 units containing 149 SSTs)
- Over 100 radioactive-waste facilities to decontaminate and decommission

The summarized items are expanded upon in the six papers that follow this presentation.

This paper reflects our collective vision of what should happen in the next five years (by September 1995) to fulfill our commitment to the Hanford Site cleanup. This paper describes the progress that we at the Hanford Site must achieve to begin full-scale cleanup. The analysis and planning described herein forms the basis for the Hanford Site "Environmental Restoration and Waste Management Site-Specific Plan for the Richland Operations Office: Detailed Information" cleanup plan (1) hereinafter called the Site-Specific Plan, whose scope (e.g., Corrective Action - Waste Management Operations Environmental Restoration - Related Research and Development) is listed below

<u>Basic Waste Management Activity:</u>	<u>Included in Tri-Party Agreement:</u>
CERCLA remedial actions (environmental restoration)	X
CERCLA Title III reporting	
Clean Air and Water Act compliance	
Landlord activities	
RCRA corrective actions	
RCRA generator compliance	
RCRA TSD facilities (permits, closures and compliance)	X
Research and development needs	in part
Site decontamination and decommissioning	
RCRA transportation compliance	
Waste minimization	
Waste treatability studies and demonstrations	X
Tri-Party Agreement - Hanford Federal Facility Agreement and Consent Order (2)	
RCRA - Resource Conservation and Recovery Act (3)	
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act (4)	

We recognize that the nation has entered a new era. The public demands more environmental protection. The public

also expects more understandable information and involvement in waste cleanup. We will fulfill that mandate. The Department of Energy-Richland Operations Office (DOE-RL) asked the States of Washington and Oregon; the Yakima, Umatilla, and Nez Perce Indian Nations; the U.S. Environmental Protection Agency, as well as the public to comment on the draft of our plan. We have changed our plan based on their comments. Our progress will be reviewed yearly in public meetings so that additional external comments can be incorporated.

#### THE HANFORD FEDERAL FACILITY AGREEMENT AND CONSENT ORDER

The Hanford Federal Facility Agreement and Consent Order (2) (Tri-Party Agreement) was signed in May 1989 by the Washington State Department of Ecology, the U.S. Environmental Protection Agency and the U.S. Department of Energy. This agreement addresses many of the high priority items that are part of the Hanford Site-Specific Plan (1) and provides the regulatory framework for compliance with the Resource Conservation and Recovery Act of 1976 (3) (RCRA) and the Comprehensive Environmental Resource, Compensation, and Liability Act of 1980 (4) (CERCLA). The Tri-Party Agreement also provides a detailed 30-year schedule for cleaning up the Hanford Site.

In support of the Tri-Party Agreement, the Hanford Site staff has identified our vision of the future to help define success achieving the provision of the agreement.

In our vision, we will have met the overall intent of the Tri-Party Agreement in the next five years if the following items have been accomplished.

- We have identified and requested the resources and commitment needed to meet the future milestones in the Tri-Party Agreement.
- We have a clearer and more complete understanding of the location of all the wastes and all have been initially prioritized for cleanup.
- We have taken actions to prevent immediate risks and to reduce the spread of contamination.
- We have met or surpassed all milestones due in the Tri-Party Agreement.
- We have addressed the concerns of the states and Indian Nations about transport of plutonium-contaminated wastes.
- We continue working with the regulators and the public to clearly define what cleanup means. We are developing an overall goal and acceptable cost-effective standards for the long-term risks that will remain after cleanup has been completed. We are addressing future land uses. All work is being done in publicly available fashion; and regulatory requirements are

being melded with technical assessments of risks and capabilities, social concerns and values, and fiscal realities.

- We have contingency plans in place to safely treat and store the Hanford Site wastes if onsite or offsite disposal facilities are delayed or not available.

Because the Hanford Site is designated as a single RCRA facility, one hazardous waste permit will be issued and maintained. Recognizing that not all the treatment, storage, and disposal groups will be ready for a permit at the same time, the initial permit will be issued for less than the entire facility. The permit will be modified over time to incorporate additional treatment, storage, and disposal units. The Hanford Site will complete all actions required to ensure compliance with interim RCRA status standards by September 1991 (except for groundwater monitoring and closure requirements). Groundwater monitoring wells will be installed around RCRA land disposal units at a rate of 30 wells in 1990 and 50 wells per year thereafter, beginning in 1991, and continuing until compliance is achieved.

A total of 44 Part B permit applications or closure plans/postclosure plans will be submitted to the Washington State Department of Ecology by 1996. The first seven of these have been submitted.

In our vision, we will have met the overall intent of the Tri-Party Agreement relative to RCRA for the next five years if the following items have been accomplished.

- All facilities meet interim regulations to ensure near-term protection of human health and safety and near-term protection of the environment.
- Applications have been submitted for about 75 percent of the permits needed to continue to use, cleanup, or close recent and current waste facilities.
- Nearly all of the liquid contaminants discharged to the soil have been treated or stopped.
- We are preventing future waste cleanup problems.
  - We understand the nature and risks of wastes that will be produced by future operations.
  - We are reducing the amount and hazards of new wastes.
  - New wastes are treated, and either safely stored or disposed.
  - All stored waste is being prepared for disposal as soon as possible after being generated.
  - The funds needed for disposal are available.

### Comprehensive Environmental Resource, Compensation, and Liability Act

A preliminary assessment/site inspection was completed in 1987 for the Hanford Site. On June 24, 1988, the U.S. Environmental Protection Agency nominated four areas of the Hanford Site for inclusion on the National Priorities Listing (NPL) on September 2, 1989. These four areas were added to the NPL.

Approximately 1,100 individual waste units have been grouped into 78 operable units. Work plans for the first 20 operable units will be prepared and submitted by 1992. A minimum of six work plans per year will be submitted until all are completed. Preparation of the first 10 work plans has begun and remedial investigation has started on the first operable unit.

In our vision, the DOE and its supporting contractors will have met the overall intent of the Tri-Party Agreement for the next five years relative to (CERCLA) requirements for inactive waste sites if the following items have been accomplished.

- We have developed and are committed to a comprehensive plan, schedule, and mutually agreed upon set of priorities to complete cleanup of inactive facilities and waste sites by 2018.
- About 50 percent of the plans to investigate the waste sites are complete.
- About 20 percent of the studies to determine the hazards and propose cleanup actions are complete.
- Detailed design or cleanup has started on about 15 percent of the sites.

### Interim Stabilization Radiation Area Reduction; and (Decontamination and Decommissioning)

About 120 contaminated outdoor areas (850 acres) have been cleaned up or stabilized since fiscal year 1978 as part of the ongoing radiation-area reduction program. We are nearing completion of the decontamination and decommissioning of the 183-H solar basin, and the strontium (hot) semiworks. In the last 15 years, we have decontaminated and decommissioned approximately 40 contaminated facilities and removed another 40 clean facilities that were no longer in use. Of the 115 facilities remaining to be decommissioned, 37 will undergo the initiation and/or completion of decontamination and decommissioning in the next five years.

Public review of the draft EIS has been completed on the decommissioning of eight surplus production reactors at the Hanford Site. The selection process of a preferred option is underway.

In our vision, interim stabilization (radiation area reduction; decontamination and decommissioning) efforts

will be successful in the next five years if the following items have been accomplished.

- Decisions have been made on decommissioning the old plutonium production reactors, and these decisions are reasonable, cost-effective, and have broad public support
- About 30 percent of the old contaminated buildings and facilities have been removed and the areas have been cleaned up.

### SINGLE-SHELL TANK WASTES

Work on determining the final disposal of the SST has been initiated under RCRA. Initial activities supporting final disposal of SST wastes have been underway for several years. In 1984 early remote technology was developed and used to make an initial sampling of a number of SSTs. The present, initial focus of the SST disposal effort is to develop and implement accurate and cost-effective means of characterizing and then classifying the contents of the SSTs. Parallel but longer-range technology development-related work is focused on several areas:

1. Development and demonstration of SST content retrieval methodologies
2. Development of a pretreatment base technology to separate tanked waste constituents.

The retrieval task focuses on development of base technology for remote retrieval of mixed high-level waste from underground SSTs while minimizing worker exposure and while demonstrating retrieval at a large scale. The pretreatment effort under a possible retrieval scenario focuses on developing or adopting methods for waste partitioning into high and low hazard and activity portions for disposal. A third area of focus is on development of appropriate waste form formulations that would support either the disposition of retrieved wastes or an in-place disposal alternative.

The Waste Characterization Plan for the Hanford Site Single-Shell Tanks (5), has been completed and comments by the regulator and peer reviewers are being incorporated. Detailed characterization is a prelude to decision making regarding disposition of tank contents. Contents and scope of the supplemental EIS on disposal of SST wastes is being developed. Phase I, statistical characterization of the contents of representative SSTs has been initiated. We recently completed an interim Tri-Party Agreement milestone by taking 15 full sludge cores from two initial reference test tanks. The complete analytical results, which will become

available by November 1990, will allow us to determine the adequacy of both our sampling and analytical techniques.

In our vision, Tri-Party Agreement requirements for disposal of SST waste will be met for the next five years if the following times have been accomplished.

- We have removed the liquids that can be pumped from all of the old SSTs, and have sealed the openings in these tanks until decisions are made on permanent disposal.
- We have developed and are testing methods to remove highly radioactive salts, sludges, and remaining liquids from the old SSTs.
- We have determined the nature of the salts and sludges in about 70 percent of the SSTs.
- We are developing the means to address the wastes that have leaked or been discharged from the SSTs.

#### GROUT TREATMENT FACILITY

Treatment of double-shell tank (DST) wastes and conversion of the low-activity portion of these wastes to grout is on the critical path of the overall defense waste management strategy for the Hanford Site. By emptying and disposing of some of the waste in DST; we will make room not only for additional interstitial liquid produced in pumping the SSTs, but will also be able to accommodate liquid mixed waste produced in other planned waste management and ongoing production operations. The first large-scale facility for the treatment and disposal of low-level radioactive liquid wastes has successfully completed the processing of 1,000,000 gal of low-level nonhazardous decontamination wastes. Paperwork (e.g., permits, risk analysis, and safety analysis documents) and process development tests (e.g., grout formulation and product testing) that support the processing of DST wastes, in accord with the Tri-Party Agreement, have been initiated. Construction of a second series of vaults to receive mixed waste from the DSTs is also underway.

In our vision, grout-related Tri-Party Agreement requirements for disposal of DST waste in the next five years, will be met if:

- Liquid low-level wastes from the DSTs are being solidified in grout. Fourteen grout campaigns are planned. This grout is to be disposed of in underground concrete vaults. Forty percent of the grout vaults needed for this waste are built and filled.

#### HANFORD WASTE VITRIFICATION PLANT

The Hanford Waste Vitrification Plant is being designed to treat and store high-level and transuranic liquid wastes that have accumulated or will accumulate in DSTs. Such wastes, after pretreatment in an existing facility called

B-Plant, will be processed into a borosilicate glass and temporarily stored in Hanford Waste Vitrification Plant. The vitrified waste will remain at the Hanford Site until a deep geologic repository is available for final waste disposal. A preliminary safety analysis report and conceptual design for the Hanford Waste Vitrification Plant has been completed. The project is in the midst of preliminary and definitive design, and RCRA permit activity is in progress. Flowsheet development and laboratory testing on tank samples is underway and waste form qualification efforts have been started. This nearly one billion dollar plant is a key facility for accomplishing the cleanup of the Hanford Site. Construction of the Hanford Waste Vitrification Plant is scheduled to begin in July 1991 to support a hot startup date of December 1999.

In our vision, vitrification plant-related Tri-Party Agreement requirements for disposal of DST waste in the next five years will be met if:

- We are building the Hanford Waste Vitrification Plant that will solidify liquid high-level wastes in glass logs for disposal in the national high-level waste repository.

#### WASTE RECEIVING AND PROCESSING FACILITY

The Waste Receiving and Processing Facility (WRAP) is designed to treat low-level and transuranic (TRU) waste that has been generated and stored at the Hanford Site. The facility will be constructed in two phases. Module 1 will start operating in September 1996 and will process, as the main feedstream, TRU contaminated waste (in drums) that has been in storage since 1970. The TRU wastes will be shipped to the Waste Isolation Pilot Plant (WIPP) for disposal. Module 2 will start operating in September 1999 and will process low-level and low-level-mixed wastes for local disposal and remotely handled wastes (low level and TRU contaminated). Module 2 will have size reduction capability and will process large waste containers, resizing the waste into acceptable packages for local disposal or for WIPP.

Transuranic waste will be retrieved, treated to meet WIPP waste acceptance criteria, certified, and shipped to the WIPP for disposal. Low-level waste will receive treatment and certification to the local disposal acceptance criteria (being developed as part of the Hanford Site-specific performance assessment for its disposal areas).

When Modules 1 and 2 are completed, the Waste Receiving and Processing Facility (WRAP) will provide waste package inspection, opening and sorting, waste segregation, compaction, repackaging, and certification for TRU, low-level and low-level-mixed wastes. Other capabilities associated with treatment of solid mixed waste, such as size

reduction, immobilization, and neutralization of chemicals, are being designed into the facility.

In the interim before completion of the WRAP facility, centralized, enhanced storage capability is provided in radioactive mixed waste and TRU storage facilities and a permitted hazardous waste storage facility.

In our vision, success in dealing with packages containing solid plutonium and hazardous mixed waste during the next five years is demonstrated if the following items have been accomplished.

- Adequate interim storage is provided onsite for TRU and mixed waste in fully compliant and permitted facilities.
- TRU waste retrieval operations have commenced.
- WRAP Module 1 is completed and operating in September 1996.
- WRAP Module 2 is under construction.

#### TECHNOLOGY DEVELOPMENT

A diversity of technological development initiatives have been piloted or completed. These include the following:

- Development of Hanford Site barrier systems aimed at protecting stabilized waste sites over the hazardous lifetime of their radioactive constituents
- Development of injectable grout formulations aimed at stabilizing existing waste sites
- Development of second- and third-generation automated geophysical field and laboratory analytical methods to support both in situ and laboratory characterization efforts
- Commercialization of an in situ vitrification process for fusing contaminated soils and sediment into a low-leach, organics-free mass
- Significant progress in database integration and improved risk-analysis methodology.

In our vision, technology efforts during the next five years will be successful if the following items are accomplished.

- New technology development directly and cost effectively supports the cleanup goals identified in the Tri-Party Agreement.
- The Environmental and Molecular Science Laboratory is constructed and has advanced our knowledge

of wastes in the environment. We have developed and tested several new cleanup technologies. Those technologies are reducing the cost of cleanup, and they are available when we need them to support Tri-Party Agreement milestones.

- We have an organization that tracks all pertinent research and development, both inside and outside of the Hanford Site, and provides an effective means for assuring that information is being applied to Hanford Site cleanup.

#### CONCLUDING THOUGHTS

This overview paper provided a brief discussion of future waste management and environmental restoration activities at Hanford Site. It has provided a summary of the themes to be discussed in the papers that follow in this special session about the Hanford Site Waste Management and Environmental Restoration efforts.

#### REFERENCES

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4. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, Public Law 96-510, 94 Stat. 2767, 42 USC 9601 et seq.
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