DEPARTMENT OF ENERGY

Disposal of Hanford Defense High-Level, Transuranic, and Tank Wastes, Hanford Site, Richland, Washington; Record of Decision (ROD).

This Record of Decision has been prepared pursuant to the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA) (40 CFR Parts 1500-1508) and the Department of Energy NEPA Guidelines (52 FR 47662, December 15, 1987). It is based on DOE's "Environmental Impact Statement for the Disposal of Hanford Defense High-Level, Transuranic, and Tank Wastes" (DOE/EIS-0113) and consideration of all public and agency comments received on the Environmental Impact Statement (EIS).

DECISION

The decision is to implement the "Preferred Alternative" as discussed in DOE/EIS-0113 (hereafter referred to as the HDW-EIS). The Department of Energy (DOE) has decided to proceed with disposal activities for the following defense wastes at the Hanford Site: double-shell tank wastes, retrievably stored and newly generated transuranic (TRU) waste, the only pre-1970 buried suspect TRU-contaminated solid waste site outside the central (200 Area) plateau, and strontium and cesium encapsulated wastes.

To process existing and future wastes from the double-shell storage tanks at Hanford for final disposal, the DOE will design, construct, and operate the Hanford Waste Vitrification Plant (HWVP); complete the necessary pretreatment modifications and operate the pretreatment facility, currently planned to be the Hanford B-Plant; and utilize the Hanford Transportable Grout Facility. The radioactive high-level waste fraction will be processed into a borosilicate glass waste form and stored at the HWVP until a geologic repository is built and ready to receive this waste. The low-activity fraction will be solidified as a cement-based grout and disposed of near surface at Hanford in preconstructed, lined concrete vaults. Existing and future double-shell tank waste will be characterized for hazardous chemical constituents, as well as other chemical constituents that might affect glass or grout formulation, before processing.

A facility will be designed, constructed and operated at Hanford to sort, process and repackage retrievably stored and newly generated TRU solid waste for shipment to the Waste Isolation Pilot Plant (WIPP) located approximately 26 miles from Carlsbad, New Mexico. The only pre-1970 buried suspect TRU-contaminated solid waste site outside the central (200 Area) plateau will be removed to the 200 Area plateau for processing for disposal as solid TRU waste.

Encapsulated cesium and strontium wastes will continue to be stored safely until such time as a geologic repository is ready to receive this waste for disposal. Prior to shipment to a geologic repository, these wastes will be packaged in accordance with repository waste acceptance specifications.

For the remainder of the waste classes covered in the HDW-EIS (single-shell tank wastes, TRU-contaminated soil sites and pre-1970 buried suspect TRU-contaminated solid waste within the 200 Area plateau), the DOE has decided to conduct additional development and evaluation before making decisions on final disposal. This development and evaluation effort will focus both on methods to retrieve and process these wastes for disposal as well as to stabilize and isolate the wastes near surface. Results from this work will be publicly available. Prior to decisions on final disposal of these wastes, the alternatives will be analyzed in subsequent environmental documentation, including a supplement to the HDW-EIS for decisions on disposal of the single-shell tank wastes.

BACKGROUND

The Hanford Site, near Richland, Washington, is a DOE installation involved in production of nuclear materials for the national defense of this country, defense nuclear waste management, research and development and related activities. In 1943, the U.S. Army Corps of Engineers selected the area, encompassing about 600 square miles, to build the first plutonium production reactors and processing facilities to assist in ending World War II. This site has been dedicated ever since to the production of national defense nuclear materials, to research, and to defense nuclear waste management activities.

The Hanford production and interim waste management operations have resulted in a number of different types of waste. These include:

- Single-shell and double-shell tank wastes in the form of sludge, slurry, saltcake, and liquid.
- Encapsulated cesium and strontium.
- Solid wastes in drums and burial boxes.
- Contaminated soils and sediments from liquid effluents disposed of in cribs, ponds, and ditches.

The HDW-EIS addresses high-level, TRU, and a third category of wastes called tank wastes. Low-level wastes specifically resulting from processing high-level, TRU, or tank wastes for final disposal are also covered in the HDW-EIS. High-level waste has relatively high radioactivity and requires long-term isolation. TRU waste consists of wastes contaminated to greater than 100 nCi/gm with elements that have atomic numbers greater than that of uranium; for example, certain isotopes of neptunium, plutonium, americium, and curium. These radionuclides are very long-lived, so TRU waste also requires long-term isolation. TRU-contaminated solid wastes were either buried with low-level waste before 1970 or retrievably stored on storage pads after 1970.

Intermixed with the radioactive wastes in the tanks are nonradioactive chemicals, some of which are considered hazardous. The use of tanks to store radioactive waste generated by the operation of processing plants began with the nuclear defense program in the 1940's. Until the early 1970's most of the processing wastes at Hanford were stored in underground, concrete encased, single-shell steel tanks. Since 1970, newly generated processing wastes have been stored in underground, concrete encased, double-shell steel tanks; and by 1981 most of the liquid wastes in single-shell tanks were removed and placed in double-shell tanks. Tank wastes, which come from a number of sources at Hanford, have been processed and transferred among tanks resulting in significant changes in the waste characteristics. Some strontium and cesium (removed from single-shell tanks to remove heat generating radionuclides) were solidified, sealed in capsules, and are presently stored in water basins or leased for beneficial use.

Interim waste management operations were evaluated in the "Final Environmental Statement - Waste Management Operations, Hanford Reservation, Richland, WA" (ERDA-1538, 1975) and DOE/EIS-0063, "Supplement to ERDA-1538" (1980). In addition, the National Academy of Sciences' Committee on Radioactive Waste Management evaluated present operations in "Radioactive Wastes at the Hanford Reservation - A Technical Review" (1978). These documents concluded that interim operations were being carried out in a safe and responsible manner, but that the DOE should move ahead with the final disposal of Hanford wastes. In 1977, a report was prepared on "Alternatives for Long-Term Management of Defense High-Level Radioactive Waste, Hanford Reservation" (ERDA-77-44). This document, along with several follow-on documents, established the basis for the alternatives evaluated in the Draft HDW-EIS.

The Notice of Intent (NOI) to prepare the HDW-EIS was published in the Federal Register at 48 FR 14029 (April 1, 1983). The Draft HDW-EIS was issued for a 120-day public review period starting April 11, 1986, and ending August 9, 1986. Approximately 1,450 copies of the Draft HDW-EIS were distributed. In addition, the DOE sponsored seven general public open houses in the Pacific Northwest in February 1986, and seven information workshops in May and June 1986 to introduce the HDW-EIS. Four public hearings were held in July 1986 to obtain comments. In addition, 243 comment letters were received which contained approximately 2,000 individual comments. After reviewing and incorporating these public and agency comments, as well as a review of previously completed analyses, the Preferred Alternative described in the Final HDW-EIS was developed. The Final HDW-EIS was issued on December 18, 1987, and a Notice of Availability was published in the Federal Register at 52 FR 49504 (December 31, 1987).

Actions to implement this decision will comply with all applicable Federal, State and local statutes, regulations, standards, and permit requirements.

DESCRIPTION OF ALTERNATIVES CONSIDERED

As described in the HDW-EIS, a number of alternatives were considered for disposing of Hanford defense high-level, TRU, and tank wastes. The three disposal alternatives evaluated in the Draft HDW-EIS were:

- Geologic Disposal of most of the wastes (98 percent of the radioactivity).
- In-Place Stabilization and Disposal of all wastes.
- Reference Alternative that combines features of both the Geologic Disposal and In-Place Stabilization and Disposal alternatives.

In addition, a No Disposal Action Alternative, continuation of present storage programs for wastes, was analyzed in accordance with the Council on Environmental Quality NEPA regulations.

A Preferred Alternative was developed after review of public and agency comments on the Draft HDW-EIS. This alternative consists of proceeding with disposal actions described in the Reference Alternative for some waste classes but deferral of disposal decisions for three other waste classes until additional development and evaluation are completed. The impacts of this alternative are analyzed in the Final HDW-EIS.

GEOLOGIC DISPOSAL ALTERNATIVE

The Geologic Disposal Alternative involves retrieval, segregation, processing, packaging, transportation, and placement of most (98 percent by radioactivity) of Hanford's defense high-level, TRU, and tank wastes in geologic repositories.

For the high-level waste repository, two hypothetical locations were evaluated. One was assumed to be at the Hanford Site and the second at an unspecified location somewhere in the United States, about 3,000 miles from the Hanford Site. This latter repository location was chosen to bound all reasonable distances and, therefore, to bound possible impacts of shipping wastes to an offsite repository. For calculational purposes, all transuranic wastes were assumed to be shipped to the WIPP site in New Mexico for disposal.

Under this alternative, existing and future wastes from both single-shell and double-shell tanks would be separated into two fractions. The high-level fraction, containing the majority of the strontium-90, cesium-137, plutonium-239, technetium-99, and other radionuclides, would be made into a borosilicate glass, packaged in suitable canisters and transported to a geologic repository for disposal. The bulk of the remaining tank waste, containing small quantities of carbon-14, iodine-129, and other radionuclides, is comparable to commercial Class C (low-level) waste as defined by the Nuclear Regulatory Commission and would be made into a cement-based grout and

disposed of in near-surface vaults on the Hanford Site. A protective barrier would be placed over these near-surface vaults and the emptied tanks, which would contain small amounts of residual waste. Encapsulated strontium and cesium waste would be packaged and disposed of in a geologic repository. TRU-contaminated soil sites, pre-1970 buried suspect-TRU contaminated solid waste, and retrievably stored and newly generated TRU-solid waste would be retrieved and appropriately packaged to meet repository acceptance criteria and transported to WIPP for disposal.

IN-PLACE STABILIZATION AND DISPOSAL ALTERNATIVE

Under this alternative, all Hanford existing and newly generated high-level, TRU, and tank wastes would be permanently disposed of near the surface, but well above the water table, using a protective barrier and marker system. There would be very little processing or treatment of wastes except for those stored in double-shell tanks. All sites would be covered with a protective barrier and marker system that would limit moisture from reaching the waste and would reduce the likelihood of intrusion.

Double-shell tank waste would be retrieved, processed as necessary, solidified in a grout waste form and disposed of near surface. Cesium and strontium capsules would be safely stored until 2010, then transferred to a packaging facility, packaged and disposed of in near-surface drywells covered with a protective barrier and marker system. Wastes in single-shell tanks would be dried and some tanks would be provided with interim heat-removal systems. All tanks would be filled to prevent subsidence and covered with a protective barrier and marker system. All TRU wastes would be covered with a protective barrier and marker system.

REFERENCE ALTERNATIVE

The Reference Alternative combines the geologic disposal and in-place stabilization and disposal options for the various waste classes. Disposal in geologic repositories would be implemented for encapsulated strontium and cesium waste, highly radioactive portions of existing and future double-shell tank waste, and retrievably stored and newly generated transuranic solid waste. This would result in about 70 percent (by radioactivity) of the high-level and TRU wastes being disposed of in repositories. The low-level fraction of double-shell tank waste would be made into cement-based grout and disposed of in near-surface vaults.

Single-shell tank waste would be disposed of by in-place stabilization and isolated from the biosphere with the protective barrier and marker system. The previously disposed TRU-contaminated soil sites and pre-1970 buried suspect TRU-contaminated solid waste sites would be further isolated to minimize possibilities of any future migration by use of a protective barrier and marker system. The only pre-1970 buried suspect TRU-contaminated solid waste not located on the 200 Area plateau would be retrieved and processed for disposal as solid TRU waste. Retrievably stored and newly generated TRU solid wastes would be processed and shipped to WIPP for disposal.

NO DISPOSAL ACTION ALTERNATIVE

The No Disposal Action Alternative is continued storage of Hanford defense wastes. Under this alternative, the waste storage sites would be monitored and maintained, but no disposal actions would be taken. Ongoing activities such as reduction of liquids in single-shell tanks would continue. Double-shell tank wastes would be transferred to new tanks about every 50 years to stay within the minimum design life for double-shell tanks. Cesium and strontium capsules would be placed in drywell storage with continued surveillance. Retrievably stored TRU waste would be reclassified as buried solid TRU waste after the 20-year retrievability period has passed. TRU-contaminated soil sites and buried suspect TRU-contaminated solid waste sites would continue to be monitored and maintained.

PREFERRED ALTERNATIVE

The Preferred Alternative, presented in the Final HDW-EIS, consists of proceeding with disposal actions described in the Reference Alternative for some waste classes but deferral of disposal decisions for three other waste classes until additional development and evaluation are completed.

Existing and future double-shell tank waste will be pretreated to separate the waste into two fractions. The high-level fraction will be processed in the HWVP and disposed of in a geologic repository, and the remaining low-activity fraction grouted and disposed of near surface in preconstructed lined concrete vaults. Design, construction, and operation of HWVP, completion of pretreatment modifications and operation of the pretreatment facility, currently planned to be at B-Plant, and construction and operation of grout vaults will be implemented. A protective barrier will be placed over the vaults prior to final closure. Mixed waste disposal will conform with the Resource Conservation and Recovery Act (RCRA) requirements.

Retrievably stored and newly generated TRU-contaminated solid waste will be retrieved, processed as necessary, and sent to WIPP for disposal. Encapsulated cesium and strontium wastes will continue to be stored safely until such time as a geologic repository is ready to receive this waste for disposal. Prior to shipment to a geologic repository, these wastes will be packaged in accordance with repository waste acceptance specifications.

Decisions on final disposition will be postponed on three waste types (single-shell tank waste, pre-1970 buried suspect TRU-contaminated solid waste, and TRU-contaminated soil sites) until additional development and evaluation are completed. The one exception is that in order to consolidate the waste DOE will proceed with exhuming and processing the only pre-1970 buried suspect TRU-contaminated solid waste site (known as the 618-11 site) located outside the 200 Area plateau.

Storage of single-shell tank waste will be continued. Prior to a decision on disposal of this waste, additional development and evaluation will be performed as follows: radioactive and hazardous waste constituents will be characterized; barrier performance will be demonstrated by both instrumented field tests and modeling; the need and methods to improve the stability of the waste form will be determined, and destruction or stabilization alternatives for hazardous constituents will be evaluated; and methods for retrieving, processing, and disposing of this waste will be evaluated. Following this additional development and evaluation, alternatives for final disposal will be analyzed in a supplement to the HDW-EIS before the final disposal decision(s). This supplement will be issued in draft for public review and comment.

For the pre-1970 buried suspect TRU-contaminated solid waste and TRU-contaminated soil sites (except for the 618-11 site) the present remedial action program will continue. Further development and evaluation are necessary before decisions on final disposition can be made for these waste classes. These evaluations will be conducted in accordance with the DOE's responsibilities under the Comprehensive Environmental Response, Compensation, and Liability Act, as amended. Development and evaluation for these two waste classes include additional characterization of selected sites' radioactive and hazardous waste constituents, establishing criteria to identify wastes unacceptable for in-place disposal, and determining and evaluating methods for retrieval, processing, and preparing this fraction for disposal. The need for and methods to improve the isolation potential and stability of the waste form will be evaluated, and void subsidence control will be demonstrated. Additional environmental analysis will be performed and appropriate environmental documentation prepared before a final decision(s) on these waste classes is made.

BASIS FOR DECISION

In compliance with NEPA, DOE has analyzed the environmental impacts of each alternative described in the HDW-EIS. DOE considered all comments received on the Draft HDW-EIS in the preparation of the Final HDW-EIS which contains DOE's responses to those comments, and in the identification of the preferred alternative. DOE also has considered comments received on the Final HDW-EIS in making its decision.

The short- and long-term environmental impacts, DOE's commitment to provide for the safe, permanent disposal of the wastes, and costs were all considered in identifying the Preferred Alternative as the alternative to be implemented. The Preferred Alternative is judged also to be the environmentally preferred alternative.

The No Disposal Action Alternative, continuation of current waste management practices over the long-term for waste that is not already disposed of, was not selected by DOE because it is contrary to DOE's commitment to provide safe, permanent disposal of the wastes.

The health and environmental impacts of the Geologic Disposal and In-place Stabilization and Disposal alternatives are relatively low and bound the impacts of the Reference and Preferred Alternatives. When the short-term (operational, transportation) and long-term impacts (from final disposal) are compared between the Geologic and In-place Stabilization and Disposal Alternatives, the Geologic Alternative has the greater short-term health and environmental impacts and lower long-term impacts. The In-place Stabilization and Disposal Alternative has lower short-term impacts, but has the potential for the greater long-term impacts.

The lower short-term impacts associated with retrieval and processing of readily retrievable waste classes together with the reduced potential for long-term impacts provide the basis for the decision to proceed with disposal in geologic repositories as described in the Preferred Alternative. This decision is consistent with evaluations and decisions resulting from the "Final Environmental Impact Statement - Management of Commercially Generated Radioactive Waste" (DOE/EIS-0046F) October 1980; the "Final Environmental Impact Statement - Long Term Management of Defense High-Level Radioactive Waste, Savannah River Plant (Research and Development Program for Immobilization)" (DOE/EIS-0023) November 1979; the "Final Environmental Impact Statement - Defense Waste Processing Facility, Savannah River Plant, Aiken, SC" (DOE/EIS-0082) February 1982; and the "Final Environmental Impact Statement - Waste Isolation Pilot Plant" (DOE/EIS-0026) October 1980. These decisions are also consistent with the position taken by the Department in the "Defense Waste Management Plan" (DOE/DP-0015) to dispose of readily retrievable high-level and transuranic waste in geologic repositories.

The technology exists to process readily retrievable and newly generated wastes (double-shell tank waste, encapsulated cesium and strontium waste, and retrievably stored and newly generated TRU waste) for final disposal. DOE considers the impacts associated with this technology to be acceptably low. Borosilicate glass was previously selected as the waste form for high-level waste for two other sites in the United States and is the selected form for high-level waste in Germany, France, and Japan. The HWVP, in addition to vitrifying double-shell tank waste, will be designed with sufficient flexibility to accommodate all single-shell tank waste should the decision be made to recover this waste. The near-surface disposal of the residual low-activity wastes (involving the Transportable Grout Facility) from processing of tank wastes involves existing technologies even though new in application. The technology exists to treat newly generated and retrievably stored TRU waste for disposal.

Retrieval of all the single-shell tank wastes, TRU-contaminated soil sites, and buried suspect TRU wastes for disposal in a geologic repository would have greater short-term risks than for the readily retrievable wastes given the current waste retrieval and processing methods. These three classes of wastes, including their hazardous components, are not well characterized. The efficacy of possible methods of treating and disposing of these wastes is not

yet proven and the consequences of such actions are not yet well defined. Therefore, additional waste characterization and additional engineering analysis of waste retrieval and disposal options are necessary before decisions for final disposition can be made regarding geologic or in-place stabilization and disposal of these wastes. These wastes can continue to be stored safely and monitored while waste characterization and engineering development and evaluation are being conducted.

MITIGATION OF ENVIRONMENTAL IMPACTS

All practical means will be used to minimize worker exposure, limit releases to the environment, and protect public health. Contaminated soil sites and buried suspect TRU-contaminated waste sites will continue to be monitored and maintained to protect against subsidence or animal and plant intrusion which could release contamination into the environment. Removal of liquids from single-shell tanks will be continued to reduce the potential for future tank leaks. In some cases retrievably stored TRU wastes will be removed remotely to minimize worker exposures. Facilities will be designed to effectively control releases and to minimize environmental impacts. Airborne emissions and any other projected releases of radioactive and hazardous waste to the environment will be kept as low as reasonably achievable. Land use and use of nonrenewable resources will be minimized to the extent possible. Use of potentially hazardous chemicals in the processing will be kept to the minimum necessary. An extensive environmental monitoring system (air quality, water quality, etc.) will be maintained both during and after disposal operations to ensure compliance with regulatory requirements and the effectiveness of the design. This monitoring program will allow for mitigating actions to be taken in a timely fashion should the need arise.

CONSIDERATIONS IN THE IMPLEMENTATION OF THE DECISION

Prior to construction of HWVP and the processing facility for TRU waste, the DOE will evaluate the need for and prepare any additional NEPA documentation required for these facilities. Disposal operations will be conducted in compliance with all applicable environmental regulations, standards, and permit requirements. The long-term protection of the environment and future populations will be a primary goal of all operations. The DOE intends to maintain an open process with respect to implementing these decisions. Such an open process will include continuing dialogue with the States of Washington and Oregon, with Federal agencies, and other affected parties. The DOE intends to continue having appropriate reviews by outside technical experts, such as the National Academy of Sciences, United States Geological Survey, the Environmental Protection Agency, and independent consultants.

Prior to disposal, DOE will continue to maintain the wastes in an environmentally sound manner and monitor the site with environmental measurement and surveillance programs.

For the United States Department of Energy

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for Defense Programs