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An Overview of Hanford Site Waste Cleanup

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CONTENTS

LIST OF FIGURES

LIST OF TABLES

AN OVERVIEW OF HANFORD SITE WASTE CLEANUP

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Waste cleanup at the Hanford Site involves actions leading to the disposal of all radioactive and hazardous wastes, managed by the Waste Management Program, and the remediation of inactive sites and facilities, managed by the Environmental Restoration Program. The Waste Management Program consists of five missions: double-shell tank wastes, single-shell tank wastes, encapsulated cesium and strontium, solid wastes (SW), and liquid effluents. A general category of program support is also included. The Environmental Restoration Program consists of two missions: past practice units and surplus facilities. Figure 1 shows the major activities for each mission.

An extensive technology research, development, demonstration, testing, and evaluation (RDDT&E) effort is under way. Emphasis is placed on research and development for missions where the technology to be implemented is uncertain, and on demonstration, testing, and evaluation for missions where the technology to be implemented is well developed. Planning is scheduled according to the key milestone dates in the *Hanford Federal Facility Agreement and Consent Order*, referred to as the Tri-Party Agreement, negotiated between the U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology).

THE WASTE MANAGEMENT PROGRAM

Table 1. Quantities Associated with the Waste Management Program.

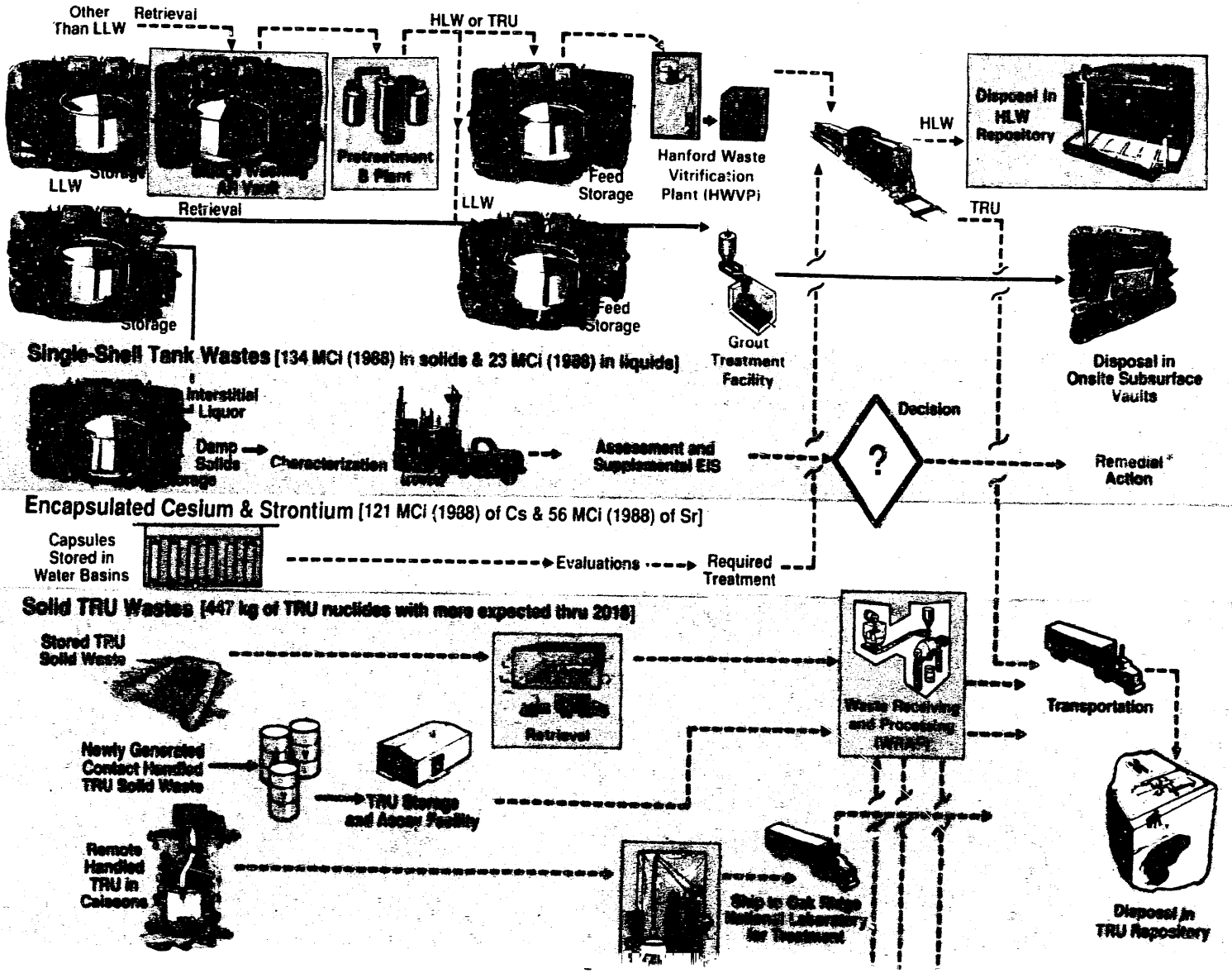
Type of Wastes	Stored Inventory (m^3)	Projected Receipt (m^3)
Double-shell tank wastes	78,000	30,000
Single-shell tank wastes	139,000[a]	None
Encapsulated cesium and strontium	4	None
Solid transuranic wastes	10,000	4,000
Solid low-level wastes	552,000[b]	350,000
Radioactive mixed wastes	1,800	10,100
Hazardous wastes	None[c]	Not projected
Liquid effluents	---[d]	---

[a]This includes 26,800 m^3 of interstitial liquids contained within the pores of the saltcake and sludge.

[b]Considered to be disposed of.

[c]Small volumes are accumulated and sent to commercial disposal facilities.

[d]33 streams have contaminant discharges to be corrected by fiscal year (FY) 1995.


Double-Shell Tank Wastes [111 MCi (1988) with more expected thru 1996]
Other Than LLW
Retrieval
HLW or TRU
LLW
Storage
Retrieval
Pretreatment B Plant
Feed Storage
Hanford Waste Vitrification Plant (HWVP)
HLW
Disposal in HLW Repository
TRU
LLW
Feed Storage
Storage
Grout Treatment Facility
Disposal in Onsite Subsurface Vaults
Single-Shell Tank Wastes [134 MCi (1988) in solids & 23 MCi (1988) in liquids]
Interstitial Liquor
Damp Solids
Characterization
Assessment and Supplemental EIS
Decision
?
Remedial Action
Encapsulated Cesium & Strontium [121 MCi (1988) of Cs & 56 MCi (1988) of Sr]
Capsules Stored in Water Basins
Evaluations
Required Treatment
Solid TRU Wastes [447 kg of TRU nuclides with more expected thru 2018]
Stored TRU Solid Waste
Retrieval
Waste Receiving and Processing (WRAP)
Transportation
Newly Generated Contact Handled TRU Solid Waste
TRU Storage and Assay Facility
Remote Handled TRU in Caissons
Ship to Oak Ridge National Laboratory for Treatment
Disposal in TRU Repository

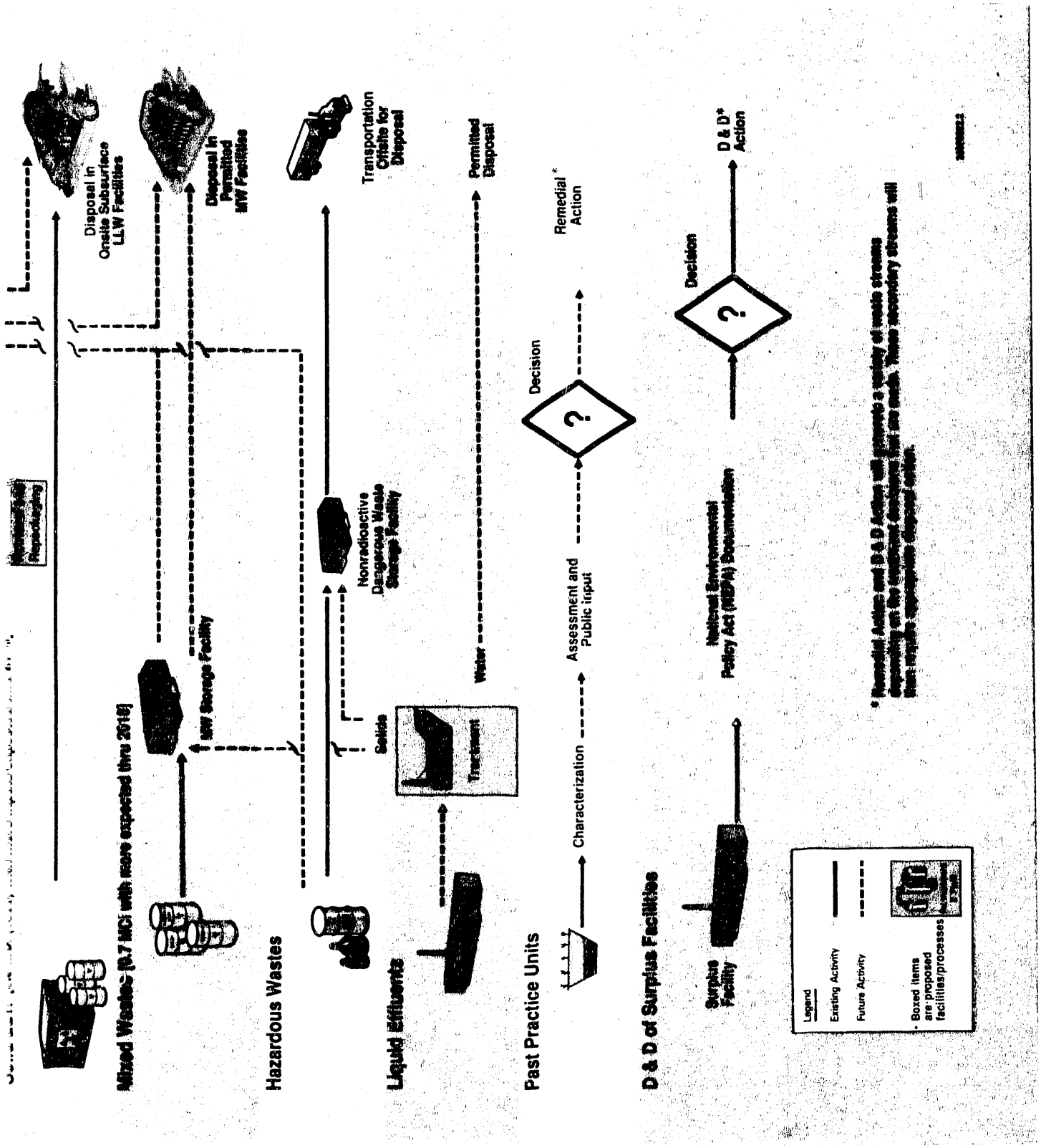


Figure 1. Waste Disposal and Inactive Site and Facility Remediation.

Double-shell tank wastes from past and ongoing operations are being stored in 28 underground storage tanks, each with a nominal capacity of 3,800 m^3. The treatment and disposal activities have been defined and are projected to require 20 years for completion. Technology associated with the retrieval and treatment processes has progressed to demonstration, testing, and evaluation.

The 244-AR Vault and B Plant are being readied for a pretreatment demonstration by October 1993 to separate certain double-shell tank wastes into high-level waste (HLW), transuranic (TRU) waste, and low-level waste (LLW) fractions. The Grout Treatment Facility (GTF) functions to combine LLW, stored in double-shell tanks or from B Plant, with grout-forming materials to produce a SW for disposal in an underground vault. The GTF has undergone a full-scale demonstration and will accept the LLW streams as they become available beginning in FY 1991. Design is progressing on the Hanford Waste Vitrification Plant (HWVP) in support of the initiation of construction in July 1991 and of hot operations in December 1999. The HWVP will combine the HLW and TRU waste fractions from B Plant with glass frit in a melter and cast the molten glass in stainless-steel canisters. As currently projected, the disposable wastes will include the following: 1,460 canisters of vitrified glass (0.62 m^3 each) of HLW for disposal in the HLW repository, 500 canisters of vitrified glass (also 0.62 m^3 each) of TRU waste for shipment to the Waste Isolation Pilot Plant (WIPP), and 44 vaults (5,000 m^3 each) of grouted LLW for onsite subsurface disposal.

Single-shell tank wastes from past operations are being stored in 149 underground storage tanks ranging in capacity from 210 m^3 to 3,800 m^3. The wastes are in the form of porous saltcake and sludge containing liquid within the interstices of these solids. The portion of the interstitial liquids that drain into perforated piping immersed in the solids is being transferred to double-shell tanks. The transfer of these drainable liquids is projected to be completed by September 1995. Disposal of the saltcake and sludge requires additional development and evaluation. Currently, characterization and assessment is being undertaken in compliance with procedures based on Resource Conservation and Recovery Act (RCRA) regulations. The assessment, concluding with the issuance of an environmental impact statement (EIS), should be completed in approximately 15 years; this time frame is influenced by a significant RDDT&E effort that must be well along before EIS alternatives can be developed and evaluated. Until the EIS process yields a definitive record of decision, the plans, schedules, and costs for the chosen remedial actions are uncertain.

Encapsulated radiocesium (1,336 capsules) and radiostrontium (597 capsules) are contained in double-walled, metal cylinders that are each approximately 50 cm in length and 6 cm in diameter. The capsules are being leased for beneficial uses or stored in water basins. The current disposal plan involves overpacking the capsules (or treating the encapsulated waste if required) and disposing of the waste in a HLW repository.

The SWs can be divided into four categories: retrievably stored and newly generated TRU waste, LLW, radioactive mixed waste (RMW) that is both radioactive and hazardous, and hazardous waste (HW) that is not radioactive. Strategies and plans are being developed for these SW streams.

The TRU waste contains transuranium radionuclides in excess of 100 nCi/g of waste. The TRU waste generated before 1985 is being stored so that it can be readily retrieved for future treatment and shipment to WIPP. Most of the TRU waste generated since 1985 is being certified for shipment to WIPP. The LLW is being disposed of onsite except for small quantities stored for treatment. The RMW is being stored for treatment and/or disposal. The HW is being sent to RCRA-permitted commercial disposal facilities. These ongoing activities are being encompassed in the Hanford Central Waste Complex which will include the Waste Receiving and Processing (WRAP) Facility. The WRAP Facility will provide treatment for the TRU waste, LLW, and MW. Hot operations for the WRAP Facility will be initiated in two phases: September 1996 and September 1999.

There are 33 contaminated liquid effluent streams that are being disposed of in the soil column. A commitment was made to the U.S. Congress in March 1987 to discontinue the use of soil columns to treat and retain suspended or dissolved contaminants from these liquid effluents streams. Waste minimization, waste treatment, and engineered disposal of concentrated wastes will be implemented. The effluent streams will undergo a primary treatment step, identified through a Best Available Technology evaluation, in which a secondary waste stream may be produced containing removed contaminants. The WRAP Facility will be used to treat these contaminants. Additional treated effluent disposal systems, after the primary treatment step, are being evaluated to ensure that the streams meet all discharge requirements. A milestone has been established to complete liquid effluent treatment facilities and upgrades by June 1995.

Program support includes those activities that cannot be incorporated as part of the other five missions but are necessary to conclude the overall waste management missions. Program support includes the following:

- Corrective activities involving upgrades that are required for facility compliance to RCRA regulations
- Waste minimization activities to develop uniform guidelines for facility-specific waste minimization plans, coordinating technology, administering an information exchange program, and developing an incentive program for continued waste minimization practices
- Operating analytical laboratories and providing the upgrades required to comply with environmental regulations to serve the ongoing waste management and environmental restoration missions. Milestones have been established to initiate operations of a MW laboratory by January 1992 and to initiate operations of expanded laboratory hot cells for HLW by June 1994

- Providing the general environmental monitoring capabilities and control measures for stack discharges (and other potential airborne releases), liquid effluent discharges, and groundwater. An aggressive schedule is being undertaken to install RCRA groundwater monitoring wells until regulatory requirements are judged to have been met.

THE ENVIRONMENTAL RESTORATION PROGRAM

Past practice units consist of approximately 1,100 individual units where radioactive waste and/or HW are deposited, either in soils or in surface or subsurface engineered structures. An extensive effort is under way involving the characterization and assessment of the 78 designated operable units, a grouping of adjacent or nearby individual units that can or should have assessments and remedial actions performed together. Six operable units are made up of single-shell tanks. Four operable units are associated with underground aquifers. A strategy has been defined with the intent of achieving closure of all operable units by the year FY 2018. Currently, characterization and assessment is being undertaken in compliance with either RCRA or the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulations. Approximately 16 years are projected to complete the assessment. This time frame is influenced by a significant RDDT&E effort that must be well along before remedial action alternatives can be developed and evaluated, including public comments. Until then, the plans, schedules, and costs for the chosen remedial actions are uncertain.

Surplus facilities are those structures, containing contaminated equipment and structural components, for which no future missions are planned. The decontamination and decommissioning (D&D) of 22 radioactive facilities and several nonradioactive facilities are complete. Surveillance and maintenance of more than 100 radioactively contaminated facilities awaiting D&D is ongoing. Several more facilities will become surplus in the future as their missions end. Three major D&D projects are in progress. Several smaller projects were completed in FY 1989. The public comment period on the EIS for the D&D of eight reactors in the 100 Areas was recently completed and a record of decision is scheduled for issuance in FY 1991.

TECHNOLOGY NEEDS

Except for the technologies that are under way and are undergoing demonstration, testing, and evaluation, a new approach is being taken in managing technology and identifying new technology. The lead responsibility for this new approach is at DOE Headquarters and is being addressed in two documents.

1. The *Applied RDDT&E Plan* identifies technology initiatives that will significantly improve the conduct of operations and reduce costs. The objective of these initiatives is to make new or adapted technologies available within approximately 5 years and to begin initiatives required within that time to make new technologies available. A technology is considered available if it has been independently evaluated in accordance with the regulatory agencies for the specific use, found to be technically acceptable, and meets regulations.

2. The *Evaluation of Mid- to Long-Term Basic Research for Environmental Restoration* focuses on new and innovative technologies for remediation of sites contaminated by past disposal practices. These technologies are being conceptualized and will be available in between 5 and 20 years in the future.

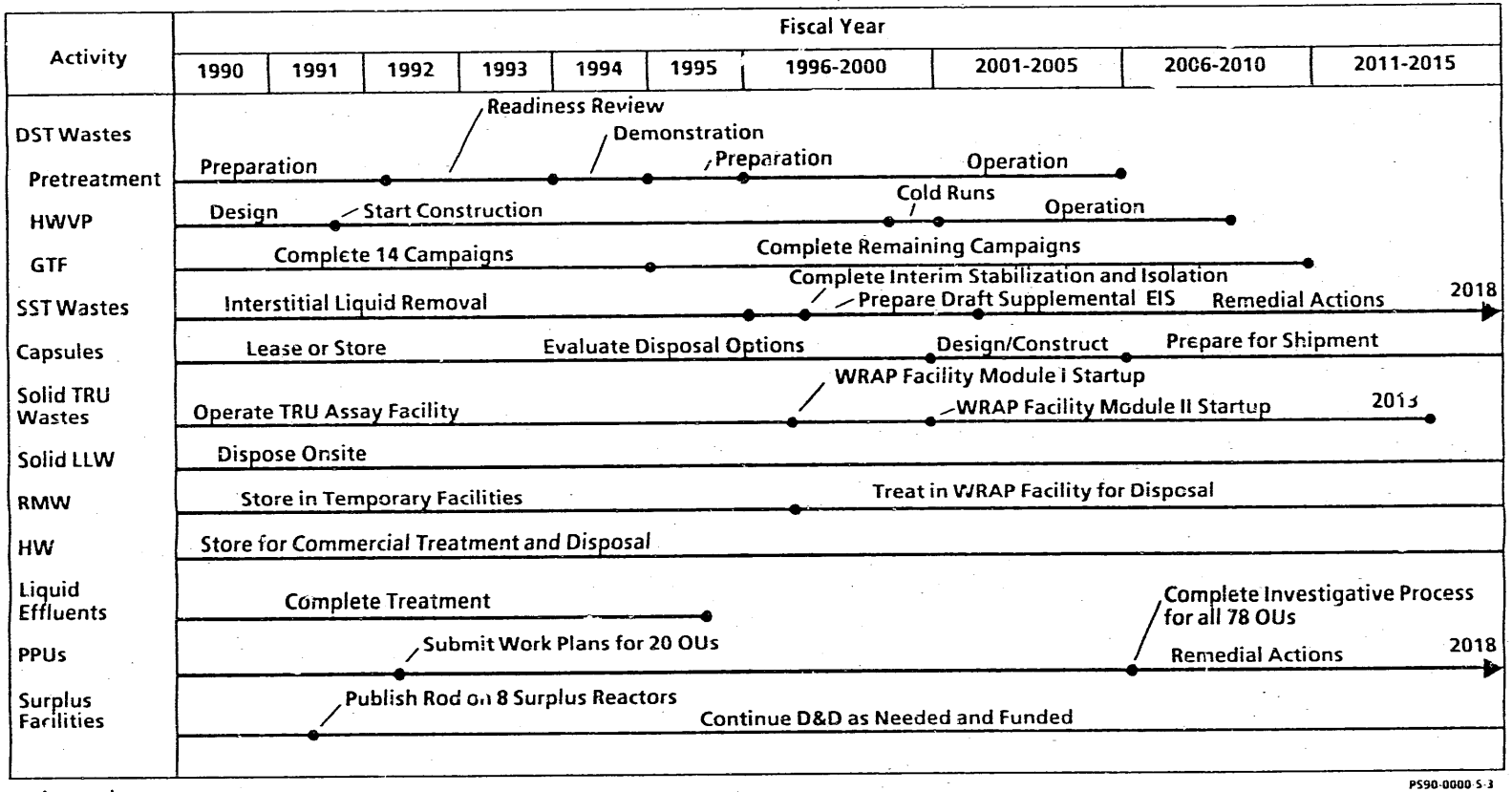
THE SUMMARY SCHEDULE AND PROJECTED FUNDING REQUIREMENTS

Table 2. Cost Projections (millions of dollars[a]).

	FY 1990	FY 1991	FY 1992	FY 1993	FY 1994	FY 1995
Waste Management[b]	391	521	579	646	723	673
Environmental Restoration	97	138	165	156	215	287
Total	488	659	744	802	938	960

[a]Finalized budgets and appropriations may not agree with these projections.
[b]Includes the separately budgeted category of Corrective Activities.

Figure 2 presents a summary schedule for each of the waste management and environmental restoration missions.



Legend:

DST	=	double-shell tank	OU	=	operable unit
EIS	=	environmental impact statement	PPU	=	past practice unit
GTF	=	Grout Treatment Facility	RMW	=	radioactive mixed waste
HW	=	hazardous waste	SST	=	single-shell tank
HWVP	=	Hanford Waste Vitrification Plant	TRU	=	transuranic
LLW	=	low-level waste	WRAP	=	Waste Receiving and Processing

Figure 2. Overview Schedule for Waste Disposal and Inactive Sites and Facilities Remediation.

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