

2.2 High-Level Waste Overview

2.2.1 HIGH-LEVEL WASTE DESCRIPTION

According to Section 2(12) of the Nuclear Waste Policy Act (42 USC 10101), high-level radioactive waste means:

- (A) *The highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and*
- (B) *other highly radioactive material that the Commission, consistent with existing law, determines by rule requires permanent isolation.*

In July 1999, DOE issued Order 435.1 *Radioactive Waste Management*. This Order and its associated Manual and Guidance set forth the authorities, responsibilities, and requirements for the management of DOE's inventory of HLW, transuranic waste, and low-level waste. Specific to HLW, DOE uses the Nuclear Waste Policy Act definition but has jurisdictional authority consistent with existing law to determine if the waste requires permanent isolation as the appropriate disposal mechanism. This authority is based on enabling legislation in the Atomic Energy Act, sections 202(3) and 202(4) of the Energy Reorganization Act of 1974, and others. The documents associated with DOE Order 435.1 describe processes for: waste incidental to reprocessing determinations; the characterization, certification, storage, treatment and disposal of HLW; and HLW facility design, decommissioning, and closure. In this EIS, the term HLW and all management aspects related to HLW are used consistent with the DOE Order 435.1 and its associated documents (see Section 6.3.2.2).

2.2.2 HIGH-LEVEL WASTE MANAGEMENT AT INEEL

From 1952 to 1991, DOE processed spent nuclear fuel at INTEC. The process was designed to recover the highly enriched uranium in the fuel using a three-step solvent extraction process. The first solvent extraction cycle resulted in a highly radioactive liquid that was considered HLW and stored at the Tank Farm. Subsequent extraction cycles and decontamination activities generated a liquid waste that was concentrated by evaporation and stored at the Tank Farm. Because of the high sodium content from decontamination activities, this waste has been called *mixed transuranic waste/sodium-bearing waste (referred to as mixed transuranic waste/SBW)*. In addition, newly generated liquid waste from processes and decontamination activities at INTEC facilities not associated with the HLW program and from other INEEL facilities has also been evaporated and *stored at the Tank Farm*. All of this liquid waste at the Tank Farm has been managed by the HLW program. Some of this waste has been calcined with other liquids, and added to the bin sets. *Calcine is stored at INTEC in the Calcined Solids Storage Facilities, which are referred to in this EIS as "bin sets."*

The Tank Farm consists of storage tanks, tank vaults, interconnecting waste transfer lines, valves and valve boxes, cooling equipment, and several small buildings that contain instrumentation and equipment for the waste tanks. *The liquid wastes are stored in ten 300,000-gallon capacity tanks (an additional 300,000-gallon tank is available as a spare). Five of the tanks are of a design known as "pillar and panel." The Tank Farm also includes four smaller 30,000-gallon waste tanks that were flushed and removed from service in 1983. Disposition of all 15 tanks is within the scope of this EIS.*

Other processes at INTEC such as the Process Equipment Waste Evaporator, which concentrates low-level liquid waste, and the Liquid Effluent Treatment and Disposal Facility, which processes evaporator overheads, generate waste that is managed by the HLW Program. Figure 2-4 shows a simplified flow diagram of the INTEC HLW system.

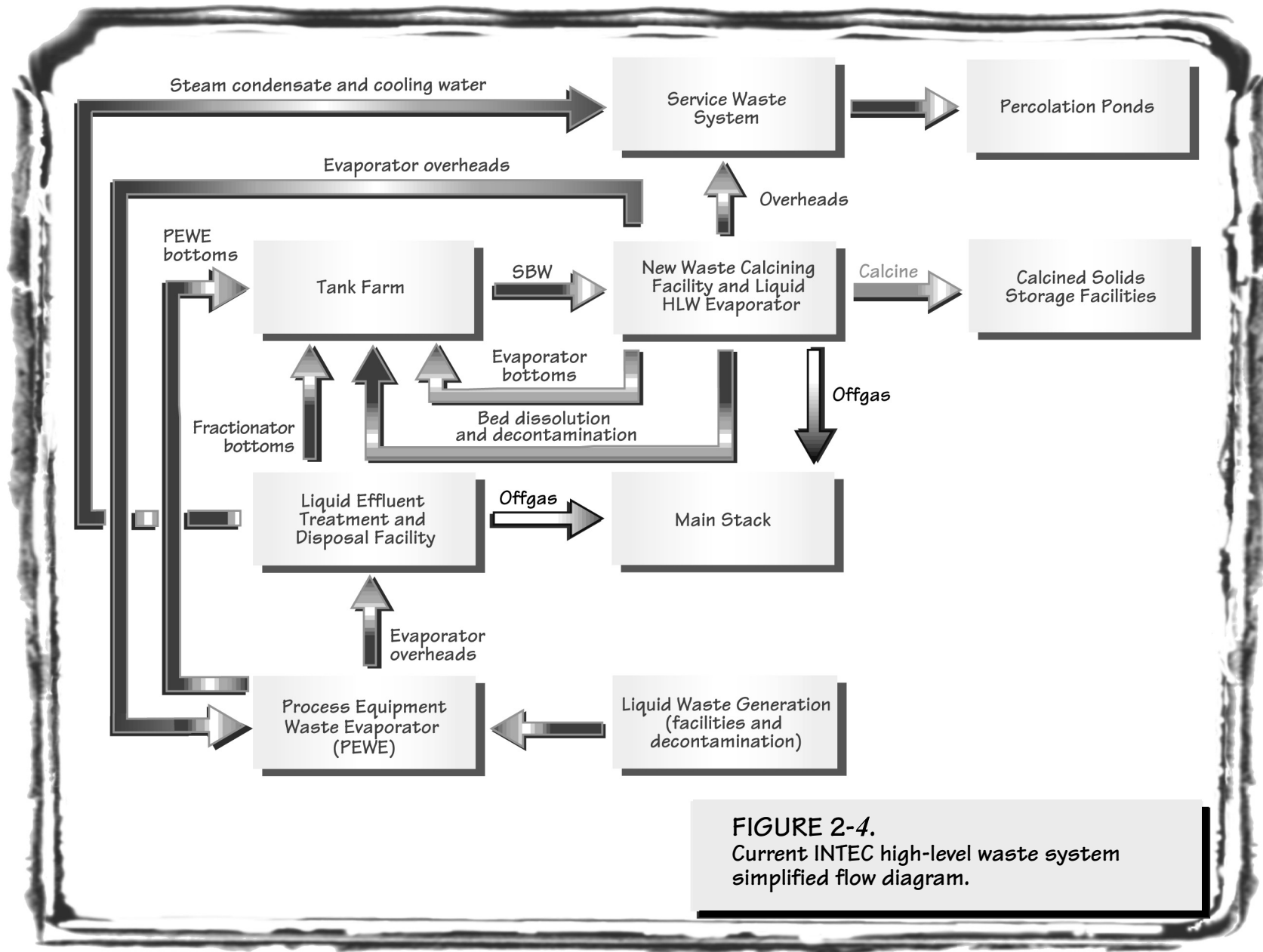


FIGURE 2-4.
Current INTEC high-level waste system
simplified flow diagram.

Background

Since 1963, liquid wastes stored at the Tank Farm have been converted to a dry, stable granular form called calcine using the waste calcining facilities at INTEC. In addition to putting the liquid into a solid form that poses less risk to the environment, calcining provides a two- to ten-fold volume reduction. As of February 1998, all of the liquid *mixed* HLW derived from first cycle uranium extraction was converted to calcine. Calcining of the mixed transuranic waste/SBW and newly generated liquid waste remaining in the tanks *continued through May 2000. The New Waste Calcining Facility calciner was placed in standby in May 2000 in accordance with the Notice of Noncompliance Consent Order. The inventory of liquids in the INTEC Tank Farm varies depending on operations and use of the High-Level Liquid Waste Evaporator.* There are approximately *1 million* gallons of liquid in the *Tank Farm. As of May 2000*, there are approximately *4,400* cubic meters of mixed HLW calcine in the bin sets. Figure 2-5 shows the seven bin sets at INTEC (six operational and one spare).

With DOE's decision to discontinue *spent nuclear fuel* processing, the mission of INTEC shifted to management of the accumulated HLW from past spent nuclear fuel processing and the wastes generated by activities and ongoing INTEC operations. Many former waste operations and fuel processing facilities at INTEC have been or will soon be shut down as their missions are completed. The Tank Farm, bin sets, New Waste Calcining Facility calciner, and associated support buildings, structures, and laboratories (as well as any HLW management facilities that would be constructed under the waste processing alternatives) would be decontaminated and decommissioned. Decisions regarding closure of these facilities under this EIS will be coordinated with the INEEL *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)* Program.

2.2.3 TECHNOLOGY DEVELOPMENT

Since the 1950s, DOE has engaged in numerous research and technology development activities to ensure that HLW and mixed transuranic waste/SBW at INTEC can be safely managed and ultimately prepared for disposition in a geo-

logic repository or other appropriate disposal facility. The technology development and demonstration studies were carried out using the laboratory and pilot plant facilities at INTEC. Areas of technology development, which took place at DOE's national laboratories and major universities, include:

- Calcining mixed transuranic waste/SBW
- Separations technologies
- Immobilization technologies
- Removing or stabilizing tank heels
- Retrieving and dissolving calcine

Calcination of Mixed Transuranic Waste (SBW)

The SNF & INEL EIS and Record of Decision determined that HLW and mixed transuranic waste/SBW in the Tank Farm should continue to be calcined while other treatment options were studied. Unlike the liquid HLW, the mixed transuranic waste/SBW cannot be calcined directly due to the presence of low melting point alkali compounds formed during calcination that clog the New Waste Calcining Facility calcine bed. A large amount of nonradioactive aluminum nitrate solution must be added to the waste before it is fed into the calciner. In order to meet its commitments to complete calcination of the mixed transuranic waste/SBW by December 2012, DOE studied alternative methods for calcining this waste. Two techniques emerged as viable candidates: (1) high temperature calcination and (2) sugar-additive calcination (LMITCO 1997). Based on the results of the pilot plant studies, DOE determined high temperature calcination to be the viable technological solution. High temperature calcination *was* demonstrated during calciner operations through June 2000.

Separations Technologies

DOE is making every effort to manage waste in the most efficient and environmentally conscious way. As part of this effort, DOE is proposing HLW volume-reduction and treatment processes that would generate low-level wastes as a byproduct. In this regard, DOE has examined several separation techniques to reduce the

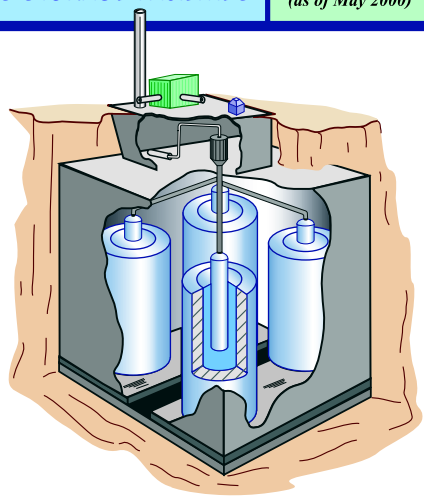
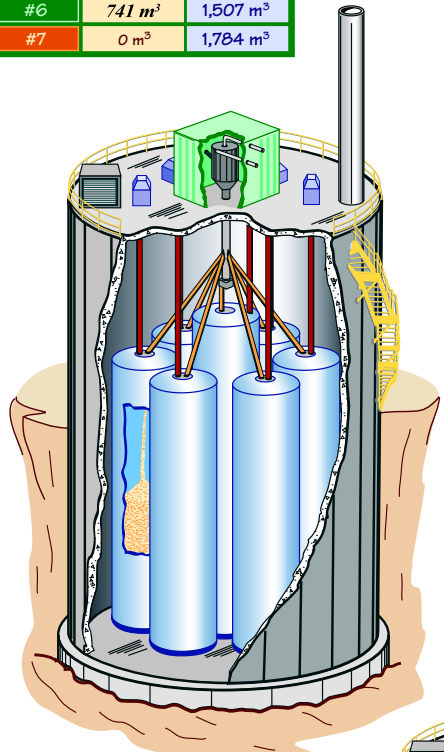
Typical Representation of Bin Sets #5, #6 & #7

BIN SET	CALCINE	CAPACITY
#5	992 m ³	992 m ³
#6	741 m ³	1,507 m ³
#7	0 m ³	1,784 m ³

CALCINED SOLIDS STORAGE FACILITIES	TOTAL (as of May 2000)	CALCINE WASTE
		4,386 m ³

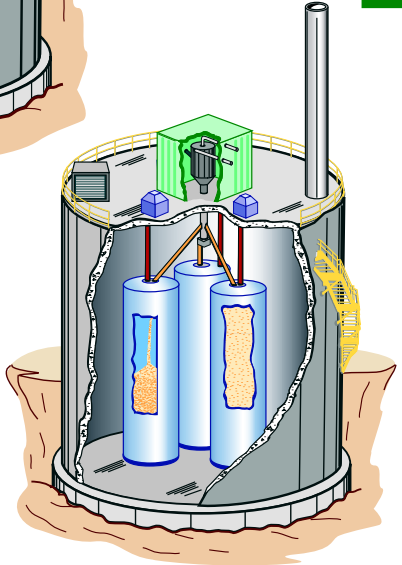
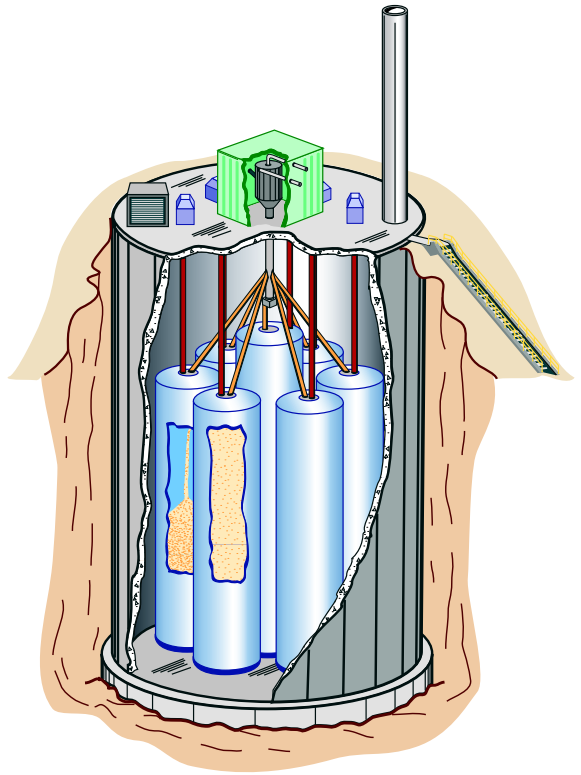
Typical Representation of Bin Sets #2 & #3

BIN SET	CALCINE	CAPACITY
#2	856 m ³	856 m ³
#3	1,092 m ³	1,097 m ³



Bin Set #1

BIN SET	CALCINE	CAPACITY
#1	217 m ³	227 m ³



Bin Set #4

BIN SET	CALCINE	CAPACITY
#4	488 m ³	488 m ³

FIGURE 2-5. The Calcined Solids Storage Facilities at INTEC (bin sets).

Background

volume of HLW that must ultimately be disposed of in a repository. These techniques would separate the waste into a small HLW fraction containing most of the short-lived (cesium, strontium) and long-lived (transuranic) radioactive components or a small transuranic waste fraction containing most of the transuranics. These fractions would be treated for acceptance at a repository. In either case, the large volume of remaining waste would be considered a low-level waste *or transuranic waste* fraction and managed accordingly. Thus, in this EIS, the term fraction is used to describe chemical separation products.

Immobilization Technologies

DOE analyzed potential technologies to treat and immobilize calcine and mixed transuranic waste/SBW (LITCO 1995). This study evaluated 27 options using criteria that considered technology, cost, and other factors. DOE identified two ways to treat mixed transuranic waste/SBW and calcine: direct immobilization or radionuclide separation followed by vitrification. Subsequent studies, such as the *High-Level Waste Alternatives Evaluation* (LMITCO 1996), examined selected options in greater detail, particularly with respect to cost. This study also considered vitrification of the waste at an alternative DOE site. DOE has also looked at ways to immobilize the low-level waste or transuranic waste fractions, resulting from the separation technologies, with grout.

Tank Heel Removal/Stabilization

To close the eleven 300,000-gallon waste storage tanks in the INTEC Tank Farm, DOE may need to design, construct, and operate equipment to internally rinse and remove the 5,000- to 20,000-gallon heels (liquid and solids remaining after a tank has been emptied using the currently installed transfer jets). Special heel removal equipment could include mixing pumps to suspend the solids in the heel and keep them in suspension for transfer out of the tanks, and pumps to transfer the mixed heel solution from the tanks. Remote technology could be used to rinse inside the tank (DOE 1995). An ongoing program of technology development continues to

What is Calcination?

Calcine results from heating a substance to a high temperature that is below its melting or fusing point. At INEEL, calcination is carried out in the calciner in the New Waste Calcining Facility where liquid HLW and mixed transuranic waste/SBW are converted into the granular solid known as calcine. The liquid waste is drawn from the Tank Farm and sprayed into a vessel containing an air-fluidized bed of granular solids. The bed is heated by combustion of a mixture of kerosene and oxygen. All of the liquid evaporates, while radioactive fission products adhere to the granular bed material in the vessel. The gases from the reaction vessel (called offgases) are processed in the offgas cleanup system before they are released to the environment.

Calcination reduces the volume of the radioactive liquid waste (usually 2 to 10 times), so less storage space is needed. The final waste form is a dense powder similar in consistency to powdered detergent. These calcined solids are transferred to the Calcined Solids Storage Facilities, commonly referred to as bin sets. The bin sets are a series of concrete vaults, each containing three to seven stainless steel storage bins.

explore improved retrieval methods. In June 1999, DOE completed a demonstration testing the ability of a specially formulated grout to move and raise the liquid residue from the bottom of the tank to the level of the jet inlet so that more liquid can be suctioned out of the tank and to stabilize the residue that cannot be removed (DOE 1999b). Figure 2-6 illustrates the **proposed process for** tank heel removal and stabilization.

Calcine Retrieval

To remove calcine from the bin sets, DOE would need to design, construct, and operate equipment to access the individual storage bins located

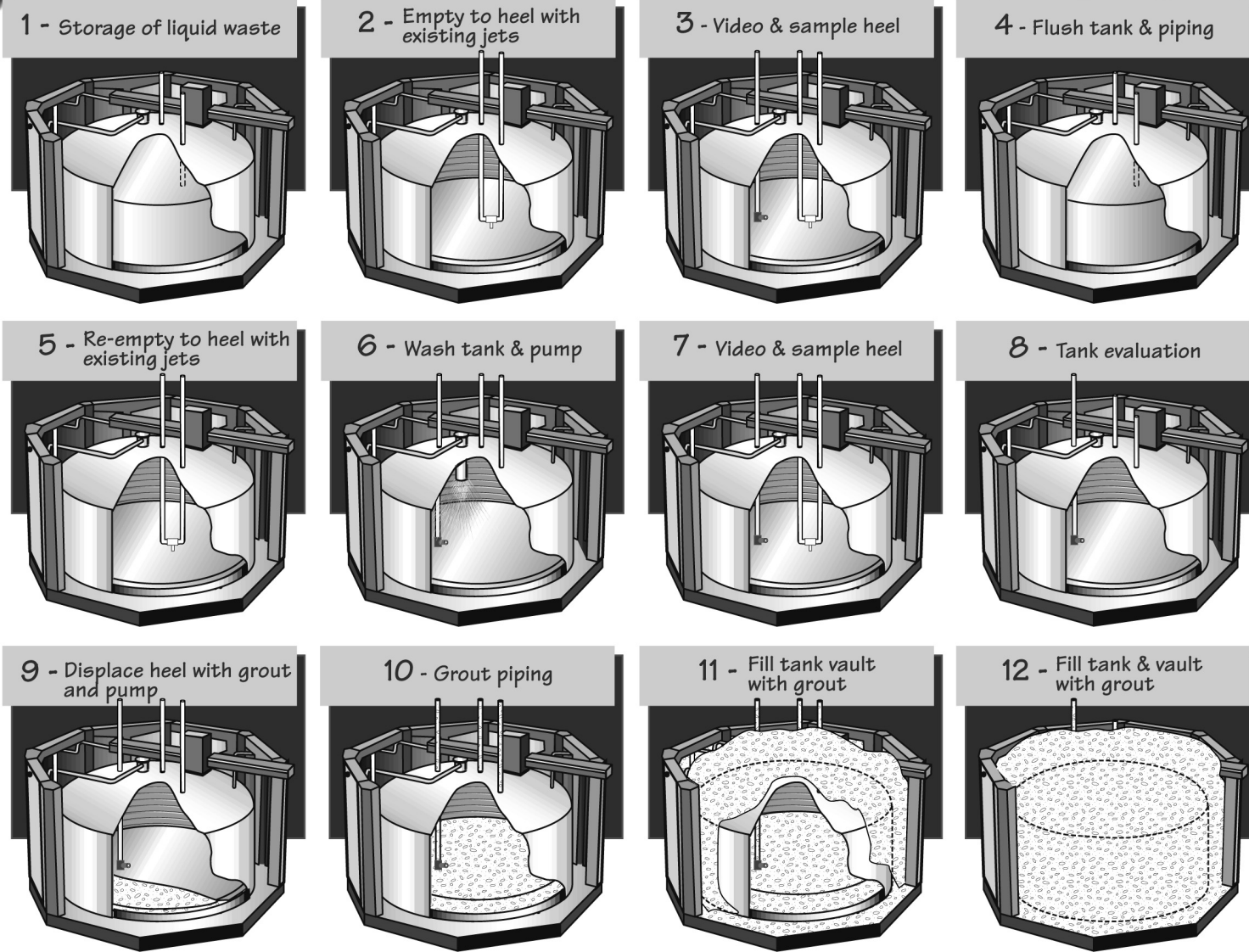


FIGURE 2-6. Tank heel removal and stabilization.

Vitrification

Vitrification is a method of immobilizing the radionuclides and hazardous constituents in the waste by incorporating them into glass. The waste is combined with frit (finely ground glass or sand) or glass-forming chemicals and the resultant mixture is melted at temperatures between 1,000 and 1,200 degrees Celsius. The molten glass mixture is then poured into stainless steel canisters to solidify.

The waste feed to the vitrification process may be in solid (e.g., calcine) or liquid form. The frit can be varied according to the type of waste in order to produce a glass with the desired characteristics. The type of glass commonly used to immobilize wastes such as those at the INEEL is known as borosilicate glass. The U.S. Environmental Protection Agency (EPA) has specified vitrification (borosilicate glass) as the best demonstrated available technology for treatment of HLW (55 FR 22520; June 1, 1990). Borosilicate glass has been used to vitrify HLW in several facilities in the United States and other countries.

within the bin set vaults, retrieve the calcine, and decontaminate the internal surfaces of the bins. Calcine retrieval is expected to use pneumatic techniques similar to the system used to transfer calcine from the New Waste Calcining Facility calciner to the bins. An air jet would agitate the calcine, and a suction nozzle would lift the agitated calcine out of the bin. This technique is expected to remove more than 99 percent of the stored calcine. If required, further cleaning could involve the use of robotics to remove additional calcine from the floor of the bins or other techniques to remove calcine from bin wall surfaces. DOE is examining cleaning techniques that are suitable for remote operation in the high radiation fields in the bins, are compatible with the bin materials, minimize secondary waste generation and environmental impacts, and enhance worker safety.

2.2.4 HIGH-LEVEL WASTE MANAGEMENT IN A NATIONAL CONTEXT

Four DOE sites now manage HLW: INEEL, the Savannah River Site in South Carolina, the Hanford Site in Washington, and the West Valley Demonstration Project in New York. DOE processed spent nuclear fuel at the first three sites. Although the West Valley Demonstration Project was a commercial spent nuclear fuel processing facility, under the West Valley Demonstration Project Act (Public Law 96-368), DOE has responsibility for the treatment of the HLW inventory and disposition of the facilities used during the demonstration.

As a result of processing spent nuclear fuel, DOE has generated approximately 100 million gallons of liquid HLW complex-wide. Approximately 90 percent of this waste remains in storage in liquid form. DOE is proceeding with plans to treat the liquid HLW, converting it to solid forms that would not be readily dispersible into air or leachable into groundwater or surface water. ***To date, treatment decisions at the Savannah River Site, West Valley Demonstration Project, and Hanford Site have generally involved solidification of HLW via vitrification.*** Vitrification would be expected to produce approximately 22,000 canisters (the canisters vary in volume of vitrified HLW from 0.6 to 1.2 cubic meters) from the current inventory of HLW at all four sites. The ***projected quantity of*** INEEL HLW ***represents*** approximately 6 percent of the total DOE inventory of immobilized HLW canisters. DOE plans to dispose of the ***immobilized HLW*** canisters in a geologic repository (DOE 2002a).

The following sections describe the current status of DOE's HLW management and facility disposition activities at the other sites. The map inside the cover of this EIS indicates the locations of these DOE sites.

Savannah River Site

The Savannah River Site currently manages approximately 34 million gallons of HLW in two Tank Farms containing a total of 51 tanks. In 1982, DOE prepared an EIS for the Defense



Waste Processing Facility, a system for treatment of HLW at the Savannah River Site that includes HLW pretreatment processes, a Vitrification Facility, **a low-level waste grout** and disposal facility, glass waste storage facilities, and associated support facilities (DOE 1982a). That EIS, its Record of Decision, and a subsequent *Environmental Assessment, Waste Form Selection for Savannah River Plant High-Level Waste* (DOE 1982b) provided environmental impact information that DOE used in deciding to construct and operate the Defense Waste Processing Facility to immobilize the HLW generated from processing activities in borosilicate glass. Modifications to the original design for the Defense Waste Processing Facility were implemented following publication of the 1982 EIS. In a Record of Decision for a supplemental EIS (DOE 1994), DOE decided to **operate** the Defense Waste Processing Facility system **with the modifications**.

The pretreatment processes would separate HLW into HLW and low-level waste fractions. Since 1990, certain low-level wastes have been blended with cement, slag, and flyash to create a concrete-like waste form known as “saltstone.” The saltstone mixture is disposed of onsite in large concrete vaults. In 1996, the vitrification facility began immobilizing the HLW sludges in borosilicate glass. As canisters of vitrified waste are produced, they are stored in shielded, underground concrete vaults pending disposal in a geologic repository.

In 1996, DOE developed the general protocol and performance objectives for operational closure of the Savannah River Site HLW tanks in consultation with the South Carolina Department of Health and Environmental Control and EPA Region IV (DOE 1996a). DOE completed the first closure of a Savannah River Site HLW storage tank in 1997. This closure configuration includes *in situ* stabilization of the residual material (the tank heel) that cannot practicably be removed using available waste removal techniques. ***A second HLW tank was also closed in 1997 using the same closure configuration. DOE has prepared an EIS (DOE 2002b) that evaluates alternatives for closure of the remaining HLW tanks at the Savannah River Site.***

Hanford Site

The Hanford Site currently manages approximately 54 million gallons of HLW in 177 underground tanks (149 single-shell tanks and 28 double-shell tanks). The waste consists of highly alkaline sludge, saltcake, slurry, and liquids. The *Tank Waste Remediation System Final EIS*, issued in August 1996, evaluated management and disposal alternatives for the Hanford tank waste. The Record of Decision calls for phased implementation of the proposal to retrieve the waste, separate it into HLW and low-activity waste fractions, vitrifying both fractions, with the low-activity waste disposed of onsite and the HLW stored onsite until it can be shipped offsite for disposal in a geologic repository (DOE 1996b). Closure of the Hanford HLW tanks will be the subject of a future National Environmental Policy Act review.



In 1992, DOE established the Tank Waste Remediation System Program to manage, retrieve, treat, immobilize, and dispose of the Hanford Site tank wastes in a safe, environmentally sound, and cost-effective manner. In FY 2001, as directed by Congress, the Tank Waste Remediation System Program was renamed the River Protection Project and is managed by the Office of River Protection. A major objective of the project is to immobilize 10 percent of the tank waste by volume and 25 percent of the tank waste by radioactivity by 2018. In May 2000, DOE terminated the privatized construction contact with British Nuclear Fuel Limited (BNFL), Inc. and awarded a competitively bid, non-privatized design and construction contract for the Waste Treatment and Immobilization Plant (WTP) to Bechtel National, Inc. (BNI) in December 2000. The facility consists of a Pretreatment Plant, a Low Level Waste (LLW) Vitrification Facility, a HLW Vitrification Facility as well as an analytical laboratory and support facilities. The facilities have been designed to support produc-

tion of up to 30 metric tons of glass per day of immobilized LLW and 1.5 metric tons of glass per day of immobilized HLW. The BNI contract requires that hot commissioning of the facility begin by December 2007 and conclude by January 2011. After hot commissioning is completed, the WTP will then be turned over to an operations contractor in 2011. The Department is continuing to accelerate the project by providing contractor fee incentives to optimize life-cycle performance, cost, and schedule, including the process design, facility design, and technologies.

West Valley Demonstration Project

The Western New York Nuclear Service Center is owned and managed by the New York State Energy Research and Development Authority. The Center contains a commercial spent nuclear fuel processing facility that operated from 1966 to 1972 and generated approximately 600,000 gallons of liquid HLW. Under the West Valley Demonstration Project Act of 1980, DOE assumed possession of the portion of the facility that includes the former reprocessing facility and the HLW tanks, waste lagoons, and waste storage areas. The Act also assigned the Nuclear Regulatory Commission to provide oversight in the areas of radiation health and safety.

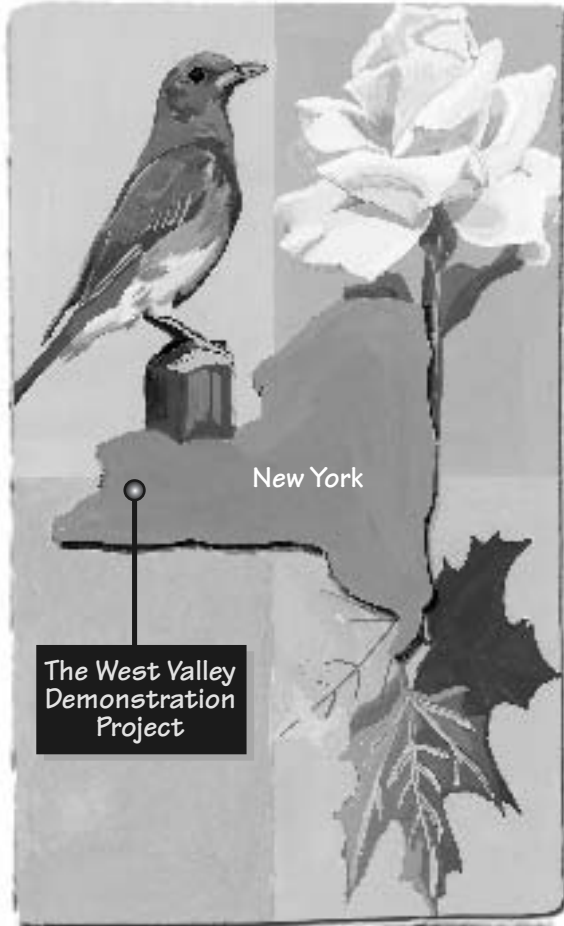
In 1982, DOE prepared an EIS and then issued a Record of Decision for the operation of the West Valley Demonstration Project that selected concentration and chemical treatment followed by vitrification as the immobilization technology for the Project's HLW inventory (47 FR 40705; September 15, 1982). Vitrification of the HLW began in July 1996. Approximately 300 canisters of vitrified HLW *will be* produced and stored, pending disposal in a geologic repository (DOE 1997b).

In 1996, DOE and the New York State Energy Research and Development Authority prepared a draft EIS that evaluated alternatives for completion of the West Valley Demonstration Project (DOE 1996c, 1997c). *DOE and the New York State Energy Research and Development Authority have revised their strategy for completing this review (66 FR 16447, March 26, 2001). DOE now intends to prepare and issue for public comment a revised Draft EIS that*

criteria for the site (67 FR 5003, February 1, 2002).

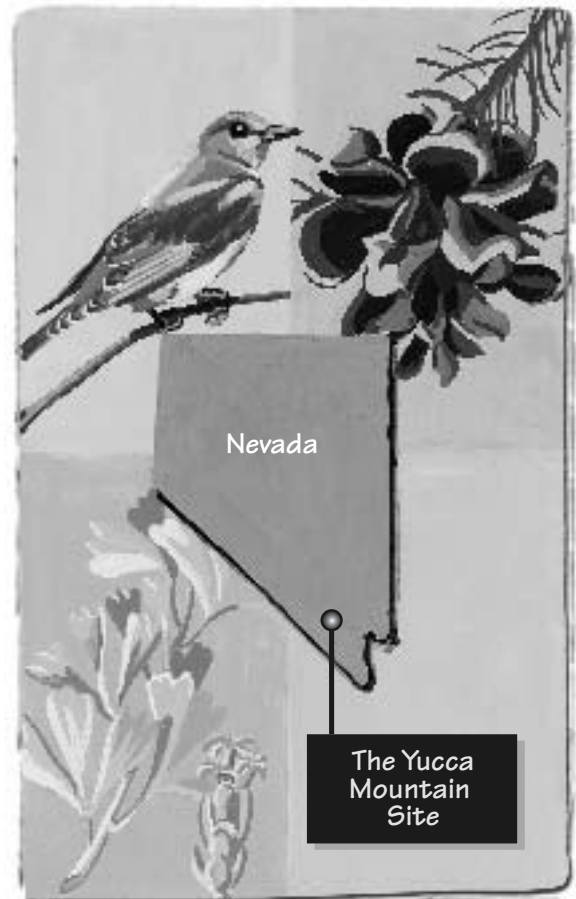
Geologic Repository at Yucca Mountain

The Nuclear Waste Policy Act, as amended (42 USC 10101 et seq.), establishes a process for determining whether to recommend the site to the President for development of a repository. As part of this decisionmaking process, **DOE** is to undertake the physical characterization of the Yucca Mountain site. **Upon the Secretary of Energy's recommendation for approval of the site and the President's determination that the site is qualified for an application for construction authorization, the Nuclear Waste Policy Act, as amended, directs the President to submit a recommendation of the site to Congress. Within 60 days of the day the President recommends the site, the Governor and Legislature of the State of Nevada can submit a notice of disapproval of the site to Congress. If the Governor and Legislature**



will focus on DOE's actions to decontaminate West Valley facilities and manage wastes controlled by DOE under the Project. DOE also intends to issue a second EIS with the New York State Energy Research and Development Authority as a joint lead agency, that would focus on site closure and/or long-term stewardship at West Valley.

The Nuclear Regulatory Commission *has developed* decommissioning criteria for the *West Valley Demonstration Project site. The Commission has issued a policy that would apply the License Termination Rule (10 CFR 20, Subpart E), which sets the decommissioning requirements for all NRC licensees, as decommissioning criteria for the West Valley Demonstration Project site. Following completion of the EIS and identification of a preferred alternative, NRC will verify that the criteria proposed by DOE are within the License Termination Rule, and will prescribe specific*



Background

do not submit a notice of disapproval within 60 days, the site designation becomes effective. If they submit a notice of disapproval, the site is disapproved unless Congress then passes a resolution approving the repository site during the first period of 90 calendar days of continuous session.

Section 114(d) of the Act instructs the Nuclear Regulatory Commission to limit the first repository to emplacement of a quantity of spent nuclear fuel containing 70,000 metric tons of heavy metal (MTHM) or a quantity of solidified HLW resulting from reprocessing that amount of spent nuclear fuel until a second geologic repository is in operation. Current projections of the spent nuclear fuel and HLW inventories from civilian and government sources exceed 70,000 MTHM.

In a report required by Section 8 of the Nuclear Waste Policy Act of 1982 (Public Law 97-425), the Secretary of Energy was required to recommend to the President whether defense HLW should be disposed of in a geologic repository with commercial spent nuclear fuel. Table 1-1 of that report, *An Evaluation of Commercial Repository Capacity for the Disposal of Defense High-Level Waste* (DOE 1985), provided MTHM equivalence for HLW.

The MTHM quantity for spent nuclear fuel is determined by the actual heavy metal content of the fuel. The Nuclear Waste Policy Act also specifies that the 70,000 MTHM limitation as it

applies to HLW is to be determined by the "...quantity of solidified high-level radioactive waste resulting from the reprocessing of such a quantity of spent nuclear fuel..." That method of determining an MTHM "equivalence" does not recognize the differences in radiological content between spent nuclear fuel and HLW.

DOE would emplace 10,000 to 11,000 waste packages containing no more than 70,000 MTHM of spent nuclear fuel and HLW in the repository. Of that amount, 63,000 MTHM would be spent nuclear fuel assemblies that would be shipped from commercial sites to the repository. The remaining 7,000 MTHM would consist of about 2,333 MTHM of DOE spent nuclear fuel, and approximately 8,315 canisters (the equivalent of 4,667 MTHM) of HLW that DOE would ship to the repository (DOE 2002a). To determine the number of canisters of HLW included in the waste inventory, DOE used 0.5 MTHM per canister of defense HLW. DOE has recognized that determination of appropriate MTHM equivalence was necessary, therefore, DOE considered several equivalency techniques, including the method based on spent nuclear fuel reprocessed, a method based on total radioactivity in the material, and a method based on radiotoxicity (Knecht et al. 1999). For a brief description of these techniques see Chapter 6 of *this EIS*. Though DOE has recognized these other equivalency techniques; DOE has used the 0.5 MTHM per canister approach since 1985 (DOE 1985).

DOE is continuing to conduct site characterization activities at Yucca Mountain to determine whether that site is suitable for geologic disposal of spent nuclear fuel and HLW. ***For status of Yucca Mountain site approval process, see Section 2.3.1: EIS for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain.*** Final technical standards for the HLW to be disposed of in the geologic repository are not yet available. Analyses in the repository EIS and other DOE National Environmental Policy Act documents and decisions based on these analyses regarding management of spent nuclear fuel and HLW are based on the best available knowledge regarding these draft technical standards. DOE evaluated alternative

Metric Tons of Heavy Metal (MTHM)

Quantities of unirradiated and spent nuclear fuel and targets are traditionally expressed in terms of metric tons of heavy metal (typically uranium), exclusive of other materials, such as cladding, alloy materials, and structural materials. A metric ton equals approximately 2,200 pounds. Section 6.3.2.4 of *this EIS* more fully describes issues related to MTHM.

treatments for the *mixed* HLW at INEEL based on the current waste acceptance criteria for the *proposed geologic* repository (DOE 1996d, 1999c; TRW 1997).

2.2.5 LEGAL REQUIREMENTS FOR HIGH-LEVEL WASTE MANAGEMENT

Environmental restoration and waste management activities at *the* INEEL are subject to *a number of* laws and regulations that apply to the treatment, storage, and disposal of wastes, and the determination of cleanup standards and schedules. This section discusses the specific requirements for management of *mixed* HLW and disposition of associated facilities at INTEC. This information is repeated in Chapter 6, Statutes, Regulations, Consultations and Other Requirements, which also provides supplemental information on environmental regulations and DOE's compliance status.

Federal and state requirements for the management of *mixed* HLW and disposition of associated facilities at INTEC include those established under:

- Atomic Energy Act
- Nuclear Waste Policy Act
- EPA Environmental Radiation Protection Standards
- Resource Conservation and Recovery Act
- Comprehensive Environmental Response, Compensation, and Liability Act
- Idaho Settlement Agreement/Consent Order
- Notice of Noncompliance Consent Order.
- Site Treatment Plan (under the Federal Facility Compliance Act)

Table 2-1 identifies site-specific agreements between DOE and the State of Idaho that affect the management of mixed HLW and disposition of associated facilities at INTEC. The table also provides a summary of the specific milestones and their current status.

Atomic Energy Act

The Atomic Energy Act of 1954 (42 USC 2011, et seq.) establishes responsibility for the regulatory control of radioactive materials including radioactive wastes. Pursuant to the Atomic Energy Act, DOE established a series of Orders to protect health and minimize danger to life or property from activities at its facilities.

Potential exists for Congress to direct the Nuclear Regulatory Commission to assume regulatory authority over DOE facilities in the time-frame of the activities analyzed in this EIS. DOE has engaged in joint pilot projects with the Nuclear Regulatory Commission to assess the feasibility of Nuclear Regulatory Commission regulation at DOE facilities. Based on these pilot projects, DOE has identified a number of unresolved issues that should be evaluated further. Because DOE is not actively pursuing Nuclear Regulatory Commission regulation of DOE's facilities, the effects of Nuclear Regulatory Commission regulation of DOE-ID facilities, if any, are not discussed in this EIS (Richardson 1999a,b,c).

Nuclear Waste Policy Act

The Nuclear Waste Policy Act of 1982, as amended (42 USC 10101 et seq.), established a national policy for disposal of HLW and spent nuclear fuel in a geologic repository.

EPA Environmental Radiation Protection Standards

In 1993, EPA issued "Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level, and Transuranic Waste," codified in 40 CFR 191.

Background

Table 2-1. Agreements between DOE and the State of Idaho for operations at INTEC.

Agreement	Summary of milestones	Status of milestones/comments
1992 Consent Order, and Amendments, Resolving a 1990 Notice of Noncompliance under RCRA (Notice of Noncompliance Consent Order)	<ul style="list-style-type: none"> - DOE must cease use of the five pillar and panel tanks by March 31, 2009 - DOE must cease use of remaining tanks by June 30, 2015 - DOE must close the calciner if operation is not commenced by January 1, 1993, or operation is discontinued for three consecutive years 	This Consent Order has been modified three times to reflect changes agreed upon between the State and DOE. None of these milestones is currently in effect.
1994 Modification to Notice of Noncompliance Consent Order	<ul style="list-style-type: none"> - DOE must calcine all <i>liquid</i> HLW by January 1, 1998 - DOE must evaluate and select <i>treatment</i> technologies for SBW and calcine by June 1, 1995 	<i>The deadline for completing calcination of liquid HLW was changed to June 30, 1998 by the 1995 Settlement Agreement/Consent Order.</i>
1995 Settlement Agreement/Consent Order, resolving the cases of Public Service Co. of Colorado v. Batt and United States v. Batt	<ul style="list-style-type: none"> - DOE shall complete the process of calcining all the remaining liquid HLW by June 30, 1998 - DOE shall commence calcination of SBW by June 1, 2001 - Begin negotiation of a plan and schedule for treatment of calcined waste by December 1999 - Complete calcination of SBW by December 31, 2012 - Treat all <i>HLW currently at INEL</i> so that it is <i>ready to be moved out of Idaho for disposal by a target date of 2035</i> 	<p><i>DOE completed calcination of the remaining liquid HLW in February 1998, by lowering the liquid level to the greatest extent possible by use of existing equipment, in accordance with the second modification to the Notice of Noncompliance Consent Order paragraph VIII.G.</i></p> <p><i>DOE met this milestone by commencing calcination of SBW in February 1998.</i></p> <p><i>In conjunction with this EIS, DOE and the State of Idaho commenced negotiation for treatment of calcined waste in September 1999.</i></p> <p>DOE is currently in compliance with this Settlement Agreement/Consent Order. Ability to meet commitments for calcination may be affected by subsequent decisions regarding treatment technologies <i>and disposal requirements.</i></p>

Table 2-1. Agreements between DOE and the State of Idaho for operations at INTEC (continued).

Agreement	Summary of milestones	Status of milestones/comments
1998 Modification to Notice of Noncompliance Consent Order	<ul style="list-style-type: none"> <li data-bbox="565 321 1036 380">- DOE must cease use of the pillar and panel <i>vault</i> tanks by June 30, 2003 <li data-bbox="565 390 1036 449">- DOE must cease use of the remaining tanks by December 31, 2012 <li data-bbox="565 459 1036 611">- <i>Closure plans developed for these tanks will address the remaining heel and vaults, and the use of these tanks and equipment for closure including any flushing or other cleaning of the tanks</i> <li data-bbox="565 789 1036 869">- <i>DOE shall submit a closure plan for at least one pillar and panel vault tank by December 31, 2000</i> <li data-bbox="565 949 1036 1138">- DOE must place the calciner in a standby mode by April 30, 1999, unless and until a hazardous waste permit is received. DOE will determine on June 1, 2000 whether to operate or not and submit a schedule for closure or for permitting 	<p data-bbox="1052 321 1421 737">These milestones are in effect, except for the requirement regarding operation of the calciner (see below). <i>DOE and the State of Idaho have agreed to define "cease use" as emptying the tanks to their heels (i.e., the liquid level remaining in each tank after lowering to the greatest extent possible by use of the existing transfer equipment). DOE intends to segregate newly generated liquid waste in 2005. DOE could employ RCRA-compliant storage after 2012, if necessary .</i></p> <p data-bbox="1052 810 1421 869"><i>DOE submitted a closure plan for two tanks in December 2000.</i></p> <p data-bbox="1052 968 1421 1100"><i>The date for operation of the calciner was extended to June 1, 2000 by the 1999 Modification to the Notice of Noncompliance Consent Order.</i></p>

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Table 2-1. Agreements between DOE and the State of Idaho for operations at INTEC (continued).

Agreement	Summary of milestones	Status of milestones/comments
1999 Modification to Notice of Noncompliance Consent Order	<ul style="list-style-type: none"> - The date for operation of the calciner is extended to June 1, 2000 	<p><i>DOE placed the calciner in standby prior to the extended deadline of June 1, 2000. Shutdown activities included flushing the system. DOE submitted a two-phased, partial closure plan on August 29, 2000, for the calciner portion of the New Waste Calcining Facility that is consistent with the Consent Order milestone and 40 CFR 265.112(a). The closure plan describes and accommodates the EIS decision-making process and schedule. If DOE decides in the Record of Decision for this EIS to upgrade and permit the calciner, DOE would modify the closure plan accordingly through the permitting process.</i></p> <p>The potential lack of availability of the calciner after June 1, 2000 could impact the milestone for completion of calcination by December 31, 2012.</p>
	<ul style="list-style-type: none"> - Begin, <i>by June 7, 1999</i>, submitting monthly <i>calciner</i> air emission reports <i>until one month after the calciner is placed in standby</i> 	<p><i>DOE began the monthly submittals to the State of Idaho by June 7, 1999 and continued until one month after the calciner was placed in standby.</i></p>
	<ul style="list-style-type: none"> - Complete a plan and schedule for inspection and corrosion coupon evaluation of the tanks by November 15, 1999 	<p><i>DOE met this milestone by submitting the plan and schedule to the State of Idaho by November 15, 1999.</i></p>

These standards provide for isolation of the radioactive portion of the waste in order to limit releases to the environment, including releases to underground sources of drinking water, for 10,000 years after disposal. This regulation would be generally applicable to the disposal of HLW or transuranic waste into any disposal system other than the proposed geologic repository at Yucca Mountain, which is exempt from these standards because site-specific standards (40 CFR 197, “Environmental Protection Standards for Yucca Mountain, Nevada”) *have been* developed. *These standards* may therefore be applicable to residual materials left in the tanks or bins at INTEC if DOE determines the residue *will be managed* as HLW or transuranic waste.

On **June 13, 2001 (66 FR 32074)**, EPA *promulgated* “Environmental Radiation Protection Standards for Yucca Mountain, Nevada” codified in 40 CFR 197. These regulations contain the site-specific public health and safety standards governing storage or disposal of radioactive material within the proposed repository at Yucca Mountain.

Resource Conservation and Recovery Act/Idaho Hazardous Waste Management Act

The *mixed* HLW, mixed transuranic waste/SBW, and associated wastes managed at INTEC *con-*

tain a combination of “characteristic” (e.g., toxic or corrosive) and “listed” hazardous wastes that are regulated under RCRA (DOE 1998a). RCRA requires regulated wastes to be treated in accordance with the applicable land disposal restrictions treatment standards before disposal. A technology for treatment of the waste that does not comply with all of the applicable treatment standards could only be used if a treatment variance or determination of equivalent treatment were obtained.

The treated waste forms (HLW and any transuranic or low-level wastes) would still be considered "mixed waste" under RCRA. Under the current waste acceptance criteria (DOE 1999c), DOE would not accept RCRA-regulated HLW at the potential geologic repository at Yucca Mountain. It would be necessary for DOE to obtain a "delisting" for the treated HLW or obtain a RCRA permit for the repository. The Waste Isolation Pilot Plant is permitted to receive certain RCRA-regulated transuranic wastes. However, it may be necessary to modify the Waste Isolation Pilot Plant's RCRA permit, or seek a delisting, in order to dispose of the transuranic waste portion of the INTEC waste. INEEL has no mixed low-level waste disposal capacity. Consequently, any mixed low-level waste fraction would need to be treated to meet land disposal restriction standards and delisted prior to onsite disposal. Further, DOE's Record of Decision for the Waste Management PEIS states that Hanford or the Nevada Test Site would serve as the regional disposal facilities for DOE's mixed low-level waste. These offsite disposal options along with available commercial facilities would be considered for any INEEL mixed low-level waste treated to meet land disposal restriction standards but not delisted.

The existing INTEC waste management facilities are regulated by the Idaho **Department** of Environmental Quality and EPA as “interim status” facilities under RCRA. The major existing HLW facilities addressed by this EIS that are regulated under RCRA include:

- Tank Farm
- Calcined Solids Storage Facilities (bin sets)

- New Waste Calcining Facility calciner
- Process Equipment Waste Evaporator
- Liquid Effluent Treatment & Disposal Facility

The Idaho Hazardous Waste Management Act regulates operations and closure of these facilities. New treatment facilities to implement DOE's decisions based on this EIS would also be regulated under RCRA.

Comprehensive Environmental Response, Compensation, and Liability Act

CERCLA, as amended by the Superfund Amendments and Reauthorization Act (42 USC 9601 et seq.), provides a statutory framework for cleaning up waste sites containing hazardous substances and provides an emergency response program in the event *or threat* of a release of a hazardous substance to the environment. The INEEL was placed on the National Priorities List in 1989 due to confirmed releases of contaminants to the environment. The State of Idaho, EPA, and DOE signed a Federal Facility Agreement and Consent Order in 1991 that outlines a process and schedule for conducting investigation and remediation activities at the INEEL. To better manage the investigation and cleanup, the Agreement divides the INEEL into 10 Waste Area Groups.

Facility disposition decisions *under this EIS* must be coordinated with the INEEL Environmental Restoration Program's Record of Decision under CERCLA for Waste Area Group 3. Waste Area Group 3 is an area containing suspected release sites designated for investigation under the INEEL Federal Facility Agreement and Consent Order which encompasses the INTEC area.

Notice of Noncompliance Consent Order

In 1992, DOE and the Idaho Department of Health and Welfare signed a consent order to resolve the Notice of Noncompliance issued by

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EPA Region 10 on January 29, 1990 (Monson 1992). This Notice of Noncompliance Consent Order addresses concerns regarding the RCRA secondary containment requirements for the INEEL HLW tanks by prescribing dates by which the tanks must be removed from service. In accordance with this Consent Order and an August 18, 1998 modification (Cory 1998), five of the tanks known as pillar and panel tanks must be removed from service (“cease use”) on or before June 30, 2003 and the remaining tanks on or before December 31, 2012. DOE-ID and the Idaho **Department** of Environmental Quality have agreed to define “cease use” as emptying the tanks to their “heels” (Cory 1998). A third modification to the Consent Order on April 19, 1999 (Kelly 1999) further stipulates that DOE must place the New Waste Calcining Facility calciner in a standby mode by June 1, 2000 unless the facility receives a hazardous waste permit for continued operation. **DOE placed the calciner in standby prior to the deadline of June 1, 2000 and submitted a two-phased, partial closure plan on August 29, 2000, for the calciner portion of the New Waste Calcining Facility that is consistent with the Consent Order milestone and 40 CFR 265.112(a). If DOE decides in the Record of Decision for this EIS to upgrade and permit the calciner, DOE would modify the closure plan accordingly through the permitting process.**

Settlement Agreement/ Consent Order

In October 1995, the State of Idaho, the Department of the Navy, and DOE settled the case of Public Service Company of Colorado v. Batt, involving the management of spent nuclear fuel at INEEL. The resulting Consent Order (USDC 1995) requires DOE, among other things, to:

- Complete calcination of all remaining non-sodium bearing liquid **mixed** HLW by June 1998 (completed February 1998)
- Start negotiations with the State of Idaho by December 31, 1999 regarding a plan and schedule for treatment of calcined waste (**begun September 1999**)

- Start calcination of liquid mixed transuranic waste/SBW by June 2001 (begun February 1998)
- Complete calcination of liquid mixed transuranic waste/SBW by December 2012
- Treat all **HLW currently** at INEEL **so that it is ready to be moved out** of Idaho **for disposal** by a target date of 2035

The Settlement Agreement/Consent Order also addresses the potential that the National Environmental Policy Act process may result in selection of an action that conflicts with the actions in the Agreement. In that event, **Section J.4 of the Agreement provides a process where DOE may request a modification to the Settlement Agreement requirements** to conform to the selected actions.

Site Treatment Plan

Under the Federal Facility Compliance Act of 1992, DOE was required to enter into an agreement with the State of Idaho as to how it would attain compliance with applicable treatment requirements for mixed wastes at INEEL. The Site Treatment Plan (DOE 1998a) sets forth the terms and conditions with which DOE must comply to satisfy the land disposal restrictions applicable to the hazardous components of the mixed wastes at INTEC. The Plan proposes treatment of **mixed** HLW and mixed transuranic waste/SBW by calcination through the New Waste Calcining Facility and a new Remote-Handled Immobilization Facility for processing the waste into forms suitable for disposal. In accordance with provisions of the Site Treatment Plan, these waste treatment proposals are updated annually by DOE.

2.3 EIS Scope and Overview

This EIS examines potential environmental impacts associated with managing mixed HLW and mixed transuranic waste/SBW and closing the HLW management facilities at INTEC. The

National Environmental Policy Act

A thorough understanding of environmental impacts that may occur when implementing proposed actions is a key element of Department of Energy decision-making. The National Environmental Policy Act provides Federal agency decision-makers with a process to consider potential environmental consequences (beneficial and adverse) of proposed actions **and alternatives** before agencies make decisions. An important part of this process is the opportunity for the public to learn about and comment on proposed agency actions before a decision is made.

The Act requires Federal agencies to consider the potential environmental impacts of their proposed major actions before implementing them. If a proposed action could have a significant impact on the environment, the agency must prepare an Environmental Impact Statement.

Environmental Impact Statement:

A detailed environmental analysis for any proposed major Federal action that could significantly affect the quality of the human environment. A tool to assist in decision-making, it describes the positive and negative environmental effects of the proposed undertaking and alternatives. A draft EIS is issued, followed by a final EIS.

Comment Period:

A regulatory minimum 45-day period for public review of a draft EIS during which the public may comment on the environmental analyses and suggest revisions or additional issues or alternatives to be evaluated in the final EIS. The agency considers these comments in its preparation of the final EIS.

Scoping:

An early and open process in which the public is invited to participate in identifying issues and alternatives to be considered in this EIS. DOE allows a minimum of 30 days for the receipt of public comments.

Record of Decision:

A public record of the agency decision, issued no sooner than 30 days after publication of a final EIS. It describes the decision, identifies the alternatives (specifying which were considered environmentally preferable) and the factors balanced by an agency in making its decision.

Alternatives:

A range of courses of action that would meet the agency's purpose and need for action. Council on Environmental Quality regulations require that an EIS consider a No Action Alternative.

EIS also includes an alternative under which the Idaho HLW would be treated at the Hanford Site.

The EIS has been prepared in accordance with requirements established under the National Environmental Policy Act of 1969, as amended (42 USC 4321 et seq), the Council on Environmental Quality (40 CFR 1500 et seq.),

and DOE (10 CFR 1021). In addition, this EIS seeks to fulfill the objectives of the National Environmental Policy Act as discussed in the Western Governors' Associations' Policy Statement (WGA 1996).

A key element of DOE decisionmaking is a thorough understanding of environmental impacts

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that may occur when implementing a proposed action. DOE, with the State of Idaho as a cooperating agency, has prepared this EIS to (1) assess various treatment and disposal alternatives and (2) provide the necessary background, data, and analyses to help decisionmakers and the public understand the potential environmental impacts of each alternative. DOE will present its decision in a Record of Decision, which will be issued after the EIS is complete.

During DOE's initial activities preparing this EIS, it became apparent that the State of Idaho has special expertise and perspectives that can assist DOE in its data gathering and analysis activities. From the perspective of DOE, it was advantageous to obtain input from the State on the regulatory implications of implementing the various alternatives considered in the EIS as early as possible in the process. From the State's perspective, early consideration of these regulatory implications and consideration of the technical aspects of the alternatives by State experts would improve the EIS and facilitate DOE's *progress* toward meeting the legal requirements of the Idaho Settlement Agreement/Consent Order, a goal the State has a very strong interest in seeing met. Among other things in the Idaho Settlement Agreement/Consent Order, DOE agreed to evaluate alternatives for the treatment of mixed HLW and *to* treat all mixed HLW at INEEL so that it is ready to be moved out of Idaho for disposal by a target date of 2035. *This* EIS will help DOE make informed decisions about how best to carry out these activities.

Agencies that agree to work together on an EIS can do so formally in several different ways (40 CFR 1501 et seq.). Accordingly, on September 24, 1998, the State of Idaho and DOE entered into a Memorandum of Understanding in which both parties agreed that the most effective relationship would be one in which DOE serves as "Lead Agency" and the State serves as the "Cooperating Agency."

2.3.1 OTHER RELATED NEPA AND CERCLA REVIEWS

DOE must manage the HLW generated at facilities across the country that were involved in the processing of spent nuclear fuel. Under current DOE plans, certain types of waste would be dis-

posed of at geologic repositories, such as the Waste Isolation Pilot Plant for defense transuranic waste or the potential repository at Yucca Mountain for HLW and spent nuclear fuel. DOE must formulate alternatives for management of mixed HLW and mixed transuranic waste/SBW at INTEC that are consistent with alternatives considered in other EISs that relate to INEEL. Consistency means that the Idaho HLW & FD EIS should reasonably take into account activities considered in other EISs that

What is Road Ready?

The Settlement Agreement/Consent Order states that "DOE shall accelerate efforts to evaluate alternatives for the treatment of calcined waste so as to put it in a form suitable for transport to a permanent repository or interim storage facility outside Idaho." In this EIS, DOE uses the term "road ready" to describe the condition the waste must be in so that it can be transported out of Idaho and be accepted by a designated storage or disposal facility.

In order to be "road ready" to leave Idaho, the mixed HLW must meet the appropriate regulatory requirements for shipping radioactive waste over U.S. highways or rail systems. Meeting regulatory requirements includes putting the treated waste into a canister that can then be overpacked *within* a transportation cask. The transportation cask will be designed for protection during normal, incident-free transportation, as well as protection from accident conditions. In order to be accepted by a designated storage or disposal facility, the waste must meet the specific waste acceptance criteria of that facility.

For example, the waste acceptance criteria for HLW at *the potential Yucca Mountain* repository are being developed by DOE. These criteria include performance assessment standards, such as how much heat can be generated over time, safety analysis concerns, and any other requirements that NRC, the licensing authority, determines are appropriate.

may affect the management of wastes or disposition of facilities at INEEL.

An EIS may use previously developed information and analyses by “tiering” from other EISs. This EIS will use and supplement, as necessary, the information contained in the *Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs EIS* (SNF & INEL EIS) (DOE 1995) and the *Final Waste Management PEIS for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (Waste Management PEIS) (DOE 1997b).

Volume 2 of the SNF & INEL EIS is a sitewide EIS for the INEEL that assessed impacts from environmental restoration and waste management actions that may be taken over a 10-year period from 1995 to 2005. Volume 2 analyzed the potential environmental impacts associated with ongoing mixed HLW treatment, storage, and management operations at the INEEL. In a Record of Decision based on the SNF & INEL EIS (60 FR 28680; June 1, 1995), DOE decided to resume operation of the New Waste Calcining Facility calciner and to convert the mixed HLW and mixed transuranic waste/SBW to calcine prior to further treatment. DOE also decided to construct a facility to treat the mixed HLW calcine (and any remaining liquid waste) in accordance with RCRA requirements and on a schedule to be negotiated with the State of Idaho under the Federal Facility Compliance Act. In addition, DOE would install special equipment in the Tank Farm to rinse the tanks’ interior walls and remove the tank heels in preparation for closure.

Initially, DOE had questions regarding the ability of bin set 1 (one of seven bin sets available for the storage of mixed HLW calcine) to meet current seismic design standards, and if confirmed, DOE may have been required to move mixed HLW calcine from bin set 1 to bin set 6 or 7. However, the resultant Unresolved Safety Question concerning the structural integrity of bin set 1 has been resolved and, based on the Safety Analysis Report (DOE 2000a), the mixed HLW calcine in bin set 1 will not have to be transferred to another bin set. However, DOE continues to evaluate the structural integrity of bin set 1.

This EIS analyzes the environmental impacts of *mixed* HLW and mixed transuranic waste/SBW management and facility disposition alternatives that encompass a broader timeframe than the 10-year period evaluated in Volume 2 of the SNF & INEL EIS. Decisions under this EIS will include (1) the future operational use of the New Waste Calcining Facility calciner, (2) the type of separations and/or immobilization technologies to be used for the mixed transuranic waste/SBW and mixed HLW at INTEC, and (3) methods for closure of HLW management facilities.

The Waste Management PEIS, issued in May 1997, is a DOE complex-wide study examining the environmental impacts associated with managing five types of radioactive and hazardous wastes generated by past, present, and future activities at sites located around the United States. The five types of waste examined in the Waste Management PEIS are low-level mixed waste, low-level waste, transuranic waste, hazardous waste, and HLW. The Waste Management PEIS characterizes and identifies the volumes of HLW at DOE facilities nationwide, including the INEEL, and uses or updates information presented in the SNF & INEL EIS. For HLW, the Waste Management PEIS only evaluated the storage of immobilized HLW in canisters; treatment and disposal of HLW were not analyzed. The preferred alternative in the Waste Management PEIS is for each of the four sites (one of which is INEEL) to store its own immobilized HLW canisters onsite until shipment to a geologic repository for disposal. The Record of Decision to proceed with DOE’s preferred alternative of decentralized storage for immobilized HLW was issued August 26, 1999 (64 FR 46661). The storage of INEEL’s immobilized HLW under the waste processing alternatives in the Idaho HLW & FD EIS is consistent with the HLW Record of Decision based on the Waste Management PEIS.

The Waste Management PEIS Record of Decision for disposal of low-level waste and mixed low-level waste was issued February 25, 2000 (65 FR 10061). DOE has decided to establish regional low-level waste and mixed low-level waste disposal at two DOE sites: Hanford and the Nevada Test Site. (The term "regional" does not impose restrictions on which DOE sites may ship waste to a disposal site.) In addition, DOE will continue, to the

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extent practicable, disposal of onsite low-level waste at INEEL, the Los Alamos National Laboratory, the Oak Ridge Reservation, and the Savannah River Site. INEEL and the Savannah River Site also will continue to dispose of low-level waste generated by the Naval Nuclear Propulsion Program. This decision, based on the Waste Management PEIS, does not preclude DOE's use of commercial disposal facilities, consistent with current DOE orders and policy. The low-level waste fraction from HLW processing at INEEL, Hanford, West Valley, and Savannah River was specifically excluded from the scope of the Waste Management PEIS. This reflected an understanding that each site would specifically evaluate these waste fractions as part of its site-specific EIS. *Therefore, as each site would specifically evaluate the waste fractions as part of its site-specific EIS, DOE has analyzed in this EIS that low-level and mixed low-level waste will be disposed of consistent with the Waste Management PEIS Records of Decision.*

In addition to the programmatic EISs described above, other related National Environmental Policy Act analyses that will be considered in the Idaho HLW & FD EIS include:

EIS for the Treatment and Management of Sodium-Bonded Spent Nuclear Fuel (DOE 2000b) - This EIS, issued in July 2000, analyzes impacts of alternatives for treatment and management of DOE's inventory of sodium-bonded spent nuclear fuel, much of which is stored at INEEL. This type of fuel contains metallic sodium between the cladding and fuel to improve heat transfer during reactor operations. Treatment of this fuel may be needed prior to disposal due to its reactive and pyrophoric characteristics. Sites analyzed for treatment of this fuel are the Argonne National Laboratory - West at the INEEL and the Savannah River Site. The EIS for sodium-bonded fuel evaluates management and treatment of some of the same types of waste that are evaluated in the Idaho HLW & FD EIS. *The Record of Decision to proceed with DOE's preferred alternative to electrometallurgically treat some of the sodium-bonded spent nuclear fuel (e.g., fuel from Experimental Breeder Reactor-II) at Argonne National Laboratory-West was issued September 19, 2000 (65 FR 56565). DOE also decided to continue to store some of the sodium-bonded spent*

nuclear fuel (fuel from Fermi-1) while alternative treatments are evaluated.

CERCLA Record of Decision for Waste Area Group 3 - The INEEL *CERCLA* Program evaluated potential remedial actions. During that evaluation, DOE identified discharges to the existing percolation ponds at INTEC to be a major factor in moving contaminants from the vadose zone under INTEC to the Snake River Plain Aquifer. Alternatives to the existing percolation ponds were evaluated in Davison (1998), including recycling, discharging to the Big Lost River, evaporation ponds, and moving the percolation ponds away from INTEC. DOE, through the *CERCLA* Record of Decision for the Operable Unit 3-13 portion of Waste Area Group 3 (DOE 1999d), decided to replace the existing percolation ponds with new percolation ponds to be constructed approximately 10,200 feet southwest of the current percolation ponds. A wastewater land application permit application for the new ponds was submitted to the State of Idaho in March 2000. *In accordance with the CERCLA Record of Decision*, the existing ponds are not expected to receive wastewater after December 2003 and the new ponds are planned to be operational by December 2003. The impacts resulting from this decision and other remedial actions at INTEC carried out by the INEEL *CERCLA* Program are presented as cumulative impacts in this EIS.

The Waste Isolation Pilot Plant Disposal Phase Final Supplemental EIS (DOE 1997d) - This supplemental EIS analyzes the treatment and storage of transuranic waste and disposal of such waste at the Waste Isolation Pilot Plant near Carlsbad, New Mexico. The final supplemental EIS was issued in September 1997. The Record of Decision for disposal of transuranic waste at the Waste Isolation Pilot Plant (63 FR 3624) was issued January 23, 1998. That decision calls for disposal of up to 175,600 cubic meters of transuranic waste at the Waste Isolation Pilot Plant after treatment, as necessary, to meet the waste acceptance criteria (Revision 5). A Record of Decision for the facility locations of treatment and storage of transuranic waste (63 FR 3629; January 23, 1998), based on the Waste Management PEIS, was issued at the same time. Some radioactive waste at INTEC may be affected by these transuranic waste management

decisions based on this supplemental EIS and the Waste Management PEIS.

EIS for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain (DOE 2002a) – *DOE prepared a draft EIS for a geologic repository at Yucca Mountain that evaluates potential environmental impacts from the construction, operation and monitoring, and eventual closure of the repository, including potential long-term post-closure effects. A supplement to the draft EIS was issued May 4, 2001 (66 FR 22540). This supplement to the draft EIS addresses the latest repository design information and the corresponding environmental impact analyses. The final EIS was completed in February 2002 (67 FR 9048, February 27, 2002) and accompanied the Secretary of Energy's recommendation to the President in early February 2002 as required by the Nuclear Waste Policy Act (Abraham 2002a). The President submitted his recommendation of the Yucca Mountain site to Congress on February 15, 2002 (Bush 2002). The Governor of the State of Nevada vetoed the recommendation on April 8, 2002. On July 9, 2002, Congress passed a resolution affirming the President's decision to designate the Yucca Mountain site for the repository. President Bush signed the resolution on July 23, 2002.*

Final Environmental Impact Statement, Tank Waste Remediation System (DOE 1996b) – The Tank Waste Remediation System EIS evaluated alternatives for retrieval, treatment, and disposal of the Hanford tank wastes. The final EIS was issued in August 1996, and DOE's Record of Decision was published February 26, 1997 (62 FR 8693). A supplement analysis (DOE 1998b) considered new information and data obtained since the final EIS. The Tank Waste Remediation System EIS is relevant to the Idaho HLW & FD EIS because a portion of the inventory of radioactive waste at INTEC is being considered for treatment at the Hanford Site.

Final Programmatic Environmental Impact Statement for Accomplishing Expanded Civilian Nuclear Energy Research and Development and Isotope Production Missions in the United States, Including the Role of the Fast Flux Test Facility (NI PEIS) (DOE 2000c) – *The NI PEIS evaluated the environmental*

impacts of four alternative strategies for meeting DOE's responsibility to ensure the availability of isotopes for medical, industrial and research applications, meeting the nuclear material needs of other Federal agencies, and undertaking research and development activities related to development of nuclear power for civilian use. In addition, the NI PEIS evaluated the environmental impacts of permanently deactivating the Fast Flux Test Facility at Hanford. The NI PEIS included an alternative to process irradiated neptunium-237 targets at the Fluorinel Dissolution Process Facility at INTEC, although that alternative was not preferred. The final NI PEIS was issued in December 2000. The Record of Decision was issued on January 26, 2001 (66 FR 7877). DOE decided to use the existing infrastructure to the extent possible and consider opportunities to enhance the existing facilities to maximize the agency's ability to address future mission needs.

2.3.2 OTHER ACTIONS

Prospective Coal Fired Power Plant - A coal fired steam plant previously used for INTEC heating may be converted to a commercial coal fired power plant under a lease agreement with a private entity. This possibility is being discussed within DOE and with prospective applicants but at this point the action is considered speculative. Before DOE decides to lease the coal-fired plant, the private entity applicant must fund the preparation an environmental assessment (EA). DOE will release the EA for public review before deciding whether an EIS is required or whether a finding of no significant impact is appropriate, and before deciding whether to lease the coal fired plant. It is expected air emissions would be the primary issue and that a new cumulative air impact analysis for the INEEL would be conducted and presented in the EA.

2.3.3 SCOPING PROCESS

The scoping process for *this* EIS began on September 19, 1997, when DOE published in the Federal Register its Notice of Intent to prepare an EIS to evaluate alternatives for managing HLW and associated radioactive wastes and

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facilities at INEEL (62 FR 49209). The Notice of Intent included DOE's preliminary identification of EIS issues.

In accordance with the Idaho HLW & FD EIS Public Scoping Plan, DOE sponsored a number of activities and worked with stakeholders to identify new alternatives and issues and allow for meaningful information exchange. The activities included open houses; booths and displays at shopping malls throughout southern Idaho; presentations to schools and civic groups; individual briefings to key stakeholders such as government and Tribal officials, interest groups, site employees, and the INEEL Citizens Advisory Board; and public scoping workshops.

Scoping workshops were conducted in Idaho Falls and Boise, Idaho. DOE made announcements in local newspapers and other media to **notify** the public **of** these meetings. The workshops provided both formal and informal ways for the public to express their views and obtain information about the intended scope of the analysis. Participants worked in breakout groups to identify issues and alternatives the EIS should address. These issues and alternatives were entered as comments into the administrative record, along with written comments and transcriptions of personal interviews with stakeholders. The scoping period ended November 24, 1997.

During the scoping process, DOE received more than 900 comments addressing 49 categories under 8 issues areas (DOE also considered 69 comments it received either before or after the scoping period). The eight areas are: (1) alternatives; (2) environment, safety, and health; (3) legal, regulatory, and political; (4) National Environmental Policy Act process and public participation; (5) social, economic, and cultural; (6) technical issues; (7) other; and (8) out of scope. The key issues that were identified during the prescoping and scoping activities included:

Treatment Criteria – There is considerable uncertainty regarding the proposed repository at Yucca Mountain and the final technical standards for wastes that could be disposed of there. Given those uncertainties, determine what criteria DOE should use to establish that the waste form(s) produced are suitable for disposal in a

geologic repository outside the State of Idaho (i.e., that a “road ready” waste form has been achieved).

Disposal – If a geologic repository is not available, determine what other disposal options exist for HLW outside the State of Idaho.

Storage/Disposal in Idaho – Clearly examine and explain any proposal to store or dispose of treated waste over the Snake River Plain aquifer, including performance-based or landfill closure of the Tank Farm as opposed to clean closure.

Hazardous Constituents – Develop a strategy for dealing with RCRA-regulated hazardous constituents.

Technical Viability/Privatization – Demonstrate in advance that the alternative selected will work. (Stakeholders were cautious regarding privatization of the proposed actions.)

Cost-risk benefits – The alternative selected should reduce health and safety risks enough to justify the cost of treatment and any additional risk to workers posed by the treatment activities.

Funding – Cleanup of the INEEL site is important, and the Federal government should seek adequate funding to honor its commitments to do so.

Compliance Concerns – Numerous, and in some cases conflicting, compliance requirements exist for the INEEL HLW management and facilities disposition activities. These conflicts should be clarified, and the compliance factors prioritized. (The majority of the **commentors** support the Settlement Agreement/Consent Order. Some **commentors** advocated consideration of a “fully compliant” alternative.)

The results of the scoping activities for this EIS are documented in the Scoping Activity Report (DOE 1998c). DOE has used the comments to refine the alternatives and options analyzed in this EIS as described in Chapter 3.

Subsequent to the scoping period, three DOE documents with potential to influence **this** EIS were subjected to public evaluation and comment. These documents are (1) the Waste Area Group 3 Remedial Investigation/Feasibility

Study (Rodriguez et al. 1997; DOE 1997e); (2) DOE's Office of Environmental Management Remediation Plan for the DOE Weapons Complex (DOE 1998d); and (3) the AMWTP EIS (DOE 1999e). To the extent that public comments on these documents affect *issues within the scope of this EIS, they are addressed.*

2.3.4 PUBLIC COMMENT PROCESS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

DOE published the Notice of Availability of the Draft EIS in the Federal Register on January 21, 2000 (65 FR 3432). The Notice of Availability provided information on how the public could obtain copies of the Draft EIS and the locations, dates, and times of the public hearings. The public was provided an opportunity to comment at public hearings held in Idaho Falls, Pocatello, Twin Falls, and Boise, Idaho; Jackson, Wyoming; Portland, Oregon; and Pasco, Washington. At these public hearings, DOE officials and the Manager of the State of Idaho INEEL Oversight Program presented overviews of the Draft EIS from their respective points of view. Members of the public were provided an opportunity to ask questions of the DOE and State representatives and to provide oral and/or written comments on the EIS. DOE initially established a 60-day public comment period. In response to public requests, DOE subsequently extended the public comment period to 90 days (65 FR 9257, February 24, 2000). DOE also held an additional public hearing in Fort Hall, Idaho.

DOE provided a variety of opportunities for the public to review and comment on the Draft EIS. In addition to the public hearings, other activities included radio announcements in four Western states, newspaper advertisements in nine states, distribution of Draft EIS information to more than 1,400 individuals and organizations in 27 states and the District of Columbia, and briefings for interested groups and individuals. Briefings were held with government and tribal officials, interest groups, INEEL employees, DOE citizens advisory boards in Idaho and Washington, and state and Federal agencies.

DOE received more than 1,000 comments from about 100 individuals and organizations, all of which have been considered in preparing the Final EIS (See the Comment Response Document, Chapter 11, which summarizes the comments received and provides responses to those summaries. See Appendix D for comment documents.). In developing its responses, DOE assembled a group including representatives of the INEEL Citizen's Advisory Board, Shoshone-Bannock Tribes, State of Idaho, and the management and operating contractor for INEEL to summarize key concerns identified during the public comment period. Based on these efforts, the key issues of concern to the public include:

Preference for treatment alternatives - Commentors expressed opinions in support of, or against, various alternatives.

Calciner operations and thermal treatment - Comments relating to operation of the New Waste Calcining Facility generally fell into two groups: those supporting the use of the calciner, and those who opposed its use. Although commentors expressed a range of positions relating to technologies (and thus alternatives) that employ thermal treatment, many opposed thermal treatment such as incineration.

Schedule for treatment - Some commentors urged DOE to treat liquid waste first because it represents a more serious threat to the environment than HLW calcine.

Reclassification of waste - Commentors were divided in their positions as to whether waste could or should be reclassified as mixed transuranic waste.

Repository issues - Commentors expressed concerns about the methods of calculating MTHM, including the uncertainties about the availability of the proposed repository for INEEL HLW and the waste acceptance criteria that precludes disposal of RCRA listed waste.

Impacts to air and water, including the Snake River Plain Aquifer - Commentors generally agreed that protection of air and water resources, particularly the Snake River Plain Aquifer, should be a primary concern.

Background

Public involvement - Commentors asked for continuing opportunities to participate in making decisions about HLW management.

Decision-making and obligations to states/tribes versus funding constraints - Commentors submitted a range of comments relating to the costs of implementing the EIS alternatives. Some recommended that costs not be considered in decision-making while others were concerned that the cost estimates provided would result in biased decision-making or that alternatives were biased because of high costs. Commentors requested information about funding and asked to be involved if DOE has to re-prioritize cleanup and waste management activities because of budget shortfalls.

Meeting agreements/requirements versus making sound technical decisions - Commentors were divided as to which should receive a higher priority: expediting treatment to meet Settlement Agreement/Consent Order and regulatory milestones, or taking more time to decide on an alternative that is potentially more technically sound.

Honoring policies/agreements/treaties with tribes - Shoshone-Bannock Tribe members maintained that DOE must honor all its promises to Native Americans.

DOE considered the public comments in the preparation of this EIS. Some comments resulted in changes to the EIS. Other comments required responses to answer technical questions, improve readers' understanding, or explain DOE policies. Some of the comments addressed activities outside the scope of this EIS (e.g., DOE actions that are unrelated or being evaluated in other National Environmental Policy Act documentation). These concerns were forwarded to the DOE organizations responsible for these National Environmental Policy Act evaluations. DOE and the State of Idaho considered public comments along with other factors such as programmatic need, health and safety, technical feasibility, and cost in arriving at their respective Preferred Alternatives.

Consideration of public comments on the draft EIS helps ensure the EIS provides information to support decision making. This EIS has been enhanced, as appropriate, in response to public comments. These enhancements include, but are not limited to, the following:

- *Identification of the DOE and State of Idaho Preferred Alternatives selected based on consideration of public comment and other information, such as DOE's top-to-bottom review of the Environmental Management Program (Abraham 2002b).*
- *Sections discussing flood studies and the potential for flooding were clarified.*
- *Appendix C.9 has been updated to include the results of quantitative sensitivity analyses of the effects of changes in assumed time of grout failure, infiltration rate, and distribution coefficients on the resulting radiation dose to human receptors.*
- *Sections of the EIS detailing the terms of the Settlement Agreement/Consent Order have been updated to be more internally consistent and to update the status of related milestones.*
- *A number of editorial changes were made to the EIS to correct errors, and to clarify discussions viewed by some commentors as misleading.*

2.3.5 OTHER INFORMATION AND TECHNOLOGIES REVIEWED

Cost Analysis of Alternatives - Although a cost report is not required as part of the National Environmental Policy Act process, DOE published a separate document, Cost Analysis of Alternatives for the Idaho High-Level Waste and Facilities Disposition Environmental Impact Statement (or Cost Report) (DOE 2000d), at the time the Draft EIS was released.

National Academy of Sciences Assessment of Alternatives - In January 1998, DOE requested the National Academy of Sciences' National Research Council to conduct an independent review of the technologies being considered for treatment of the mixed HLW calcine and the mixed transuranic waste/SBW at INEEL.

In December 1999, the National Academy of Sciences issued its report Alternative High-Level Waste Treatments at the Idaho National Engineering and Environmental Laboratory (NAS 1999). This report addressed several issues and provided recommendations, including:

- *The need for DOE to develop and implement a sampling and characterization plan to obtain adequate characterization data for mixed HLW and mixed transuranic waste/SBW*
- *The need for DOE to conduct integrated testing of waste processing steps*
- *The need for DOE to resolve waste form and disposal uncertainties*
- *Recommendation to maintain interim storage of mixed HLW calcine until it is known where HLW can be sent, in what waste form, and by what transportation pathway*
- *Recommendation to confirm the useful lifetime of bin sets for interim storage of mixed HLW*
- *Recommendation to solidify mixed transuranic waste/SBW as soon and as simply as possible, without further calcination*
- *Recommendation to conduct a comparative risk analysis to determine "cost/benefit" of waste processing versus little or no processing*
- *Recommendation to consider six additional treatment options for processing mixed transuranic waste/SBW. The recommended treatment options were reviewed and evaluated by subject matter experts. Section 3.3.9 and Appendix*

B of this EIS provide information on the results of the evaluation.

DOE considered the National Academy of Sciences' report and its recommendations in its analysis of the alternatives evaluated in this EIS.

Tanks Focus Area Assessment of Technologies - In June 2000 the Tanks Focus Area, at DOE's request, conducted an independent technical review of a narrowed list of waste treatment technologies under consideration by the DOE Decision Management Team tasked with conducting analyses and developing a recommended preferred alternative for this EIS. The Tanks Focus Area review focused on assessments of technical maturity, research and development status, and identification of technology gaps and uncertainties. Their report (TFA 2000) provided the following recommendations:

- *Adopt vitrification as a baseline.*
- *Pursue cesium ion exchange as an option to backup vitrification.*
- *Eliminate universal solvent extraction from further consideration.*
- *Consider methods that maximize heel solids retrieval, but not to the detriment of meeting the Notice of Noncompliance Consent Order milestone to cease use of the HLW tanks by December 2012.*
- *Aggressively pursue completion of a waste incidental to reprocessing determination for mixed transuranic waste/SBW.*
- *Consider a "phased" decision for calcine treatment. Carry forward vitrification and separations options to a future decision date consistent with plans to meet the 2035 "road-ready" compliance date in the Settlement Agreement/Consent Order.*
- *Eliminate the Hot Isostatic Pressed Waste Option.*

Background

In August 2000, the Tanks Focus Area also conducted a follow-up independent technical review (TFA 2001) of a proposed steam-reforming treatment process for mixed transuranic waste/SBW to determine its feasibility, applicability, and cost realism, and provided the following recommendations:

- Maintain and pursue direct vitrification as the baseline technology for treating and immobilizing mixed transuranic waste/SBW.*
- Do not pursue further steam reforming initiatives for treatment of mixed transuranic waste/SBW to produce waste forms for direct disposal in a HLW geologic repository or at the Waste Isolation Pilot Plant.*
- Follow a multi-step process with appropriate go/no go decision points to properly evaluate further steam reforming of mixed transuranic waste/SBW to produce an interim solid form suitable for subsequent vitrification.*
- Consider the application of steam reforming to the treatment of the offgas that would be generated by direct vitrification of the mixed transuranic waste/SBW.*

DOE considered the Tanks Focus Area reports and recommendations as a part of its analysis of the EIS alternatives.

DOE Management Assessment of Alternatives - In September 2001 the DOE Assistant Secretary for Environmental Management requested an assessment of the preferred alternative recommended by the DOE and State of Idaho Decision Management Team and approved in October 2000. The assessment

was to be conducted under the following assumptions:

- Sodium bearing waste may be managed as mixed transuranic waste*
- Treated SBW may be disposed of at WIPP*
- Calcine is an acceptable final waste form for disposal at the geologic repository*
- Steam reforming is an acceptable treatment technology for the SBW*
- The mixed transuranic/SBW can be grouted in place*
- The calciner may be operated in its present interim status configuration.*

The assessment team decided to add the Steam Reforming Option to the Final EIS in response to public and agency comment and additional information received from private sector industry.

The option of containerizing the mixed HLW calcine and shipping it to the geologic repository was added to this EIS as part of the Non-Separations Alternative in the Steam Reforming Option.

The option of grouting the mixed transuranic/SBW in place was eliminated from detailed analysis in this EIS because the waste would have to be removed from the tanks and the process involved to neutralize and grout the waste would result in a substantial increase in waste volumes with no long term reduction in risk to the environment.

The option of operating the calciner in its interim status configuration is not included in the detailed analysis in the Final EIS based on programmatic considerations.