UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:	Docket No. 63-001-HLW
U.S. DEPARTMENT OF ENERGY	ASLBP NO. 09-892-HLW-CAB04
(High-Level Waste Repository)	March 3, 2010

STATE OF WASHINGTON'S PETITION FOR LEAVE TO INTERVENE AND REQUEST FOR HEARING

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I. IDENTIFICATION OF PETITIONER AND BASIS FOR STANDING

The State of Washington (Washington) petitions for leave to intervene in this proceeding. Washington seeks intervention to oppose an anticipated motion by the Department of Energy (DOE) to dismiss with prejudice its application for a construction authorization to proceed with a deep geologic repository for high-level radioactive waste and spent nuclear fuel at Yucca Mountain, Nevada. Washington's petition for intervention should be granted because it meets the Atomic Safety and Licensing Board's (ASLB or Board) intervention requirements. As further outlined below, Washington has a keen interest in DOE's anticipated motion. Washington hosts and is overseeing the cleanup of nearly two-thirds of the nation's defense related high-level radioactive waste. Even within Washington, the disposition of this waste is intimately tied to the Yucca Mountain project. DOE's anticipated motion should not be heard without argument from Washington, which is uniquely situated among the parties to this proceeding.

A. Standing as a Matter of Right [10 C.F.R. § 2.309(d)]

1. Intervenor Information [10 C.F.R. § 2.309(d)(1)(i)]

The petitioner is the State of Washington and is represented in this proceeding by the following individuals:

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2. The Nature of Washington's Right Under the Act to be Made a Party to the Proceeding [10 C.F.R. § 2.309(d)(1)(ii)]

The Atomic Energy Act (AEA) provides that the Nuclear Regulatory Commission (NRC) must provide a hearing to any state whose interest may be affected by a proceeding for the granting of a license or construction permit and must admit any such entity as a party to the proceeding. 42 U.S.C. § 2239(a)(1)(A). This proceeding concerns DOE's application for a construction authorization for the Yucca Mountain repository. As demonstrated below, Washington has an interest in this proceeding that may be affected. Under the AEA, Washington therefore has a statutory right to be made a party to this proceeding.

Under the NRC's rules of procedure, a state has standing to participate even if the facility at issue in not located within that state. 10 C.F.R. § 2.309(d)(2); *see also, Crow Butte Resources, Inc.* (In Situ Leach Facility), ASLBP-08-867-02-MLA-BD01, 68 NRC 691, 701-02 (2008). Washington will address each element of the NRC's standing rule in turn.

3. The Nature and Extent of Washington's Interest in the Proceeding [10 C.F.R. § 2.309(d)(1)(iii)]

Washington is home to DOE's Hanford Nuclear Reservation (Hanford), which occupies 586 square miles in south-central Washington. Between 1944 and 1989, the United States produced plutonium at the Hanford site for use in nuclear weapons. Affidavit of Suzanne L. Dahl-Crumpler (Dahl Aff.) ¶ 10. Plutonium production and other activities at Hanford created enormous amounts of radioactive and mixed radioactive and hazardous wastes. Much of this waste remains at Hanford today, still awaiting cleanup and/or proper disposal.

Hanford is currently storing approximately 53 million gallons of waste generated from the reprocessing of spent nuclear fuel for plutonium production. Dahl Aff. ¶¶ 10, 11, 13. This volume accounts for nearly two-thirds of the nation's total volume of defense-related high-level radioactive waste. Dahl Aff. ¶¶ 16, 41. The waste has been called a "witch's brew" containing at least 46 identified radionuclides and at least 26 hazardous waste (chemical) constituents. Dahl Aff. ¶¶ 13, 14. Within the tanks, the waste takes on various liquid, slurry, sludge, saltcake, and vapor forms. Dahl Aff. ¶ 12.

This waste is largely being stored in 177 large underground tanks. Dahl Aff. ¶ 11, 17. Of these tanks, 149 are "single-shell tanks" (SSTs) that do not comply with applicable hazardous waste tank standards. Dahl Aff. ¶ 19. The SSTs were built between 1944 and 1964 and the average tank is now 42 years past its expected 25-year design life. Dahl Aff. ¶ 19. All 149 SSTs have been declared "unfit for use" by DOE under Washington's Hazardous Waste Management Act (HWMA) and the federal Resource Conservation and Recovery Act (RCRA). Dahl Aff. ¶ 20. Of these 149 tanks, 67—or more than one-third—are "known or suspected leakers" that have together released approximately 1 million gallons of waste to Hanford's surrounding soils. Dahl Aff. ¶ 22. Once released, tank waste constituents will persist in the environment for thousands of years to come. Dahl Aff. ¶ 23. Some of this released waste has now reached groundwater in the central portion of the Hanford Reservation. Dahl Aff. ¶ 23. This groundwater eventually flows into the Columbia River, which is vital to the environment and economy of the Pacific Northwest. Dahl Aff. ¶ 23. The combination of tank waste already released and tank waste that may be released in the future poses a serious threat of irreversible environmental harm within Washington, and beyond. Dahl Aff. ¶¶ 23, 24.

Further leakage from Hanford's SSTs (and even Hanford's currently compliant double-shell tanks) is to be expected, however, unless the waste is timely retrieved from the tanks. Dahl Aff. ¶ 24. Hanford lacks sufficient compliant storage capacity to allow for the continued uninterrupted retrieval of waste from all of Hanford's SSTs. Dahl Aff. ¶ 29. In fact, there is currently insufficient double-shell tank (DST) capacity to allow for the transfer of more than a limited amount of the waste now stored in the SSTs. Dahl Aff. ¶ 29. To date, DOE's strategy for addressing this situation has by and large been to rely on the prospective treatment capacity of a future Waste Treatment Plant (WTP) to process tank waste. Dahl Aff. ¶ 29. Irrespective of tank storage issues, this plant is necessary because Hanford's tank waste is being stored in violation of an HWMA/RCRA prohibition on indefinitely storing "land disposal restricted waste" in lieu of treating that waste to specified standards. Dahl Aff. ¶ 15. To date, the nature of the radioactive constituents in Hanford's tank waste has precluded any such treatment. Dahl Aff. ¶ 15.

The WTP is thus the lynchpin for completing Hanford's tank waste mission. Dahl Aff. ¶ 30. DOE has expected that once on-line, the processing of waste through the WTP will free up DST capacity, which will in turn allow for the continued transfer of waste retrieved from the SSTs to the DSTs.[1]

The WTP, in turn, is intimately tied to the Yucca Mountain project. From its very inception, the WTP's treatment approach (which involves separating tank waste into low-activity

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[1] DOE is subject to legal compliance milestones administered by Washington requiring DOE to retrieve the waste from all 149 of Hanford's SSTs by 2018, and to treat Hanford's entire 53 million gallons of tank waste to HWMA/RCRA land disposal standards by 2028. Dahl Aff. ¶ 26. These milestones are under the Hanford Federal Facility Agreement and Consent Order (HFFACO, a.k.a. "Tri-Party Agreement"), to which Washington (through its Department of Ecology), the Environmental Protection Agency, and DOE are parties. Dahl Aff. ¶ 25. Among other things, the HFFACO is a compliance order issued by Washington pursuant to the HWMA and in satisfaction of RCRA. Dahl Aff. ¶ 25. In 2008, Washington filed suit against DOE for breach of these milestones. A prospective settlement of that suit would establish new milestones for these activities, together with a new judicial consent decree covering WTP construction/initial operation and certain SST retrievals. This settlement has undergone public notice and comment, but has not yet been executed by the parties. *See* Dahl Aff. ¶ 27.

and high-level waste fractions, both of which will be vitrified) has been developed in consideration of the Nuclear Waste Policy Act, (NWPA) 42 U.S.C. § 10101 et seq. (2009). Dahl Aff. ¶ 39. Under DOE's 1996 Tank Waste Remediation System EIS and Record of Decision, disposal of the WTP's vitrified high-level waste output, in which the bulk of the radionuclides will be concentrated, is to occur offsite in a deep geologic repository in order to permanently isolate the waste from humans and the environment to the greatest extent practicable. Dahl Aff. ¶ 40.

Based on this key planning assumption, the WTP has and is being designed and constructed to satisfy performance standards specific to the Yucca Mountain facility. Through a series of references, DOE's contract for design, engineering, and construction of the WTP requires that the facility be designed and built to produce a product that satisfies waste acceptance standards specific to the Yucca Mountain repository, as promulgated by the NRC under 10 C.F.R. pt. 63. Dahl Aff. ¶¶ 42-43. These include matters such as canister size, weight, and configuration; radionuclide content; and thermal output limits. Dahl Aff. ¶ 43.

The WTP is a $12.3 billion facility. Dahl Aff. ¶ 31. The complex as a whole is currently 52 percent complete, with design and engineering at 78 percent complete and construction at 48 percent complete. Dahl Aff. ¶ 44. The ability to alter design and construction of the complex is significantly foreclosed. The systems and components of the Pretreatment (PT) Facility, High-Level Waste (HLW) Facility, and Analytical Laboratory (LAB) are sufficiently complete to support the processing of high level waste to meet disposal requirements specific to the Yucca Mountain facility. Dahl Aff. ¶ 44. If the Yucca Mountain repository is terminated, significant regulatory, administrative, and technical issues will have to be revisited at Hanford. This could result in a construction tear-down and rebuild of the WTP to accommodate design and engineering changes necessary to meet another repository's waste acceptance criteria, with significant impacts to cost, scope, and a legally-binding compliance schedule overseen by Washington.[2] Dahl Aff. ¶ 44.

This would create a ripple effect throughout Hanford's entire tank waste cleanup mission. Based on DOE's current approach, a delay in the WTP will cause a delay in SST retrievals. This, in turn, will exacerbate the already dire risks associated with Hanford's stored tank waste. Even if the WTP is not delayed, any vitrified high-level waste produced to satisfy Yucca Mountain-specific standards could potentially become stranded at Hanford if it is not suitable for a different geologic repository.[3] Dahl Aff. ¶ 44. At a minimum, DOE's plan for interim storing high-level waste canisters will have to be significantly revised. Dahl Aff. ¶ 45.

Finally, Hanford's high-level tank waste is not the only waste stream in Washington presumptively slated for Yucca Mountain disposal. Hanford is storing more than 2000 metric tons of spent nuclear fuel associated with defense production. Dahl Aff. ¶ 46. Hanford is also storing 1,335 capsules of cesium and 601 capsules of strontium, which DOE has planned to either vitrify though the WTP or ship directly to a deep geologic repository. Dahl Aff. ¶ 47. Finally, approximately 581 metric tons of commercial spent nuclear fuel (projected) is being stored at the Columbia Generating Station, operated by Energy Northwest on land leased within the Hanford Reservation. Termination (or significant delay) of the Yucca Mountain project would affect the disposition of all these waste forms. Dahl Aff. ¶ 49. Without a deep geologic repository, Hanford and Washington are faced with indefinite long term storage of vitrified high-

[2] *See* footnote 1.

[3] Vitrified high-level waste is not amenable to any further reprocessing. Dahl Aff. ¶ 45.

level waste, cesium and strontium capsules, and spent nuclear fuel without a final disposal path identified.

Based on the above facts, Washington has a direct and concrete interest in this proceeding and in DOE's anticipated attempt to terminate this proceeding with prejudice.

4. The Possible Effect of a Decision or Order by the NRC Affecting Washington's Interest [10 C.F.R. § 2.309(d)(1)(iv)]

DOE has announced its intention to withdraw its construction authorization application with prejudice. A decision granting DOE's anticipated motion to dismiss may forever foreclose siting a deep geologic repository at Yucca Mountain.

Washington has already outlined above the effects that termination of the Yucca Mountain project may have on Hanford's tank waste mission, along with the disposition of other waste forms stored at Hanford. These effects will confound Washington's regulatory interest in DOE's compliance with hazardous waste laws at Hanford,[4] affect Washington's interest as the owner of lands and waters potentially affected by releases from Hanford (e.g., the Columbia River), and affect Washington's interest as a sovereign on behalf of its citizens. *See, e.g., Massachusetts v. Envir. Prot. Agency*, 549 U.S. 497, 518-19 (2007). These effects will thus constitute a "concrete and particularized injury" and a "distinct and palpable harm" that Washington will suffer if DOE's motion is granted. *Id.* These effects, which could stem from DOE's anticipated motion if granted, will be redressed if DOE's anticipated motion is denied by this Board. Finally, these effects are within the zone of interests to be protected by the NWPA. *See* 42 U.S.C. § 10131(a)(2) (focus of NWPA is on addressing the nation's problem of high-level waste accumulation, which uniquely affects Washington); 42 U.S.C. § 10131(a)(6) (finding of

[4] *See* footnote 1.

the importance of state participation in the development of repositories). The effects are also within the zone of interests of the Atomic Energy Act. *See* 42 U.S.C. § 2239 (providing procedural opportunities to states).[5]

B. Discretionary Intervention [10 C.F.R. § 2.309(e)]

In the event that Washington is determined to lack standing to intervene as a matter of right under 10 C.F.R. § 2.309(d), Washington alternatively seeks to intervene as a matter of discretion on the following grounds:

1. Washington's Participation will Assist in Developing a Sound Record [10 C.F.R. § 2.309(e)(1)(i)]

By granting Washington intervention, the Board will ensure that it has an adequate record to render a fully informed decision on DOE's anticipated motion to dismiss. This is discussed in further detail in Section I.C.8, *infra* (discussing the development of a sound record in the context of untimely intervention).

2. The Nature and Extent of Washington's Interests in the Proceeding [10 C.F.R. § 2.309(e)(1)(ii)]

Washington incorporates by reference the discussion in Section I.A.3, *supra*.

3. The Possible Effect of Any Decision or Order That may be Issued in the Proceeding on Washington's Interests [10 C.F.R. § 2.309(e)(1)(iii)]

Washington incorporates by reference the discussion in Section I.A.4, *supra*.

C. Non-Timely Intervention [10 C.F.R. § 2.309(c)]

The NRC's rules allow for late-filed petitions to intervene and set forth eight factors upon which such motions should be considered. 10 C.F.R. § 2.309(c)(1); *Dominion Nuclear Connecticut, Inc.* (Millstone Nuclear Power Station, Units 2 & 3), CLI-05-24, 62 NRC 551

[5] Washington also asserts that these effects are within the zone of interests protected under the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq.

(2005). NRC licensing boards have very broad discretion in their approach to balancing the eight factors. *Virginia Electric & Power Co.* (North Anna Power Station, Units 1 & 2), ALAB-342, 4 NRC 98 (1976) *superseded by statute on other grounds*, Pub. L. No. 97-145, as recognized in *Envirocare of Utah Inc.*, LBP-928, 35 NRC 167 (1992). However, in considering such petitions, the NRC gives the "good cause" factor the most weight. *Dominion Nuclear Connecticut, Inc.*, 62 NRC at 564-55. If a petitioner cannot establish good cause, then its demonstration on the other factors must be compelling. *Id.* Washington's petition satisfies each factor.

1. Good Cause [10 C.F.R. § 2.309(c)(1)(i)]

DOE's construction authorization application was noticed for hearing on October 22, 2008.[6] The Board directed that petitions to intervene were to be filed within 60 days of that date. Washington did not file a petition at that time because DOE's application appeared to be on course to be adjudicated by this Board on the merits. While Washington takes the position that the NWPA requires the high-level waste at Hanford to ultimately be disposed of at a deep geologic repository, Washington was satisfied that DOE's application in this matter would be fully and fairly litigated without Washington's participation. Washington was comfortable that the ultimate determination of whether construction of the Yucca Mountain repository should be authorized would be decided on the merits of DOE's application. Furthermore, as contended in Section II *infra*, Washington believes that DOE lacks discretion under the NWPA to withdraw its construction authorization application with prejudice. Washington thus saw no reason to intervene during the prescribed 60-day period.

[6] Notice, 73 Fed. Reg. 63,029 (Oct. 22, 2008).

Less than one year ago, in May 2009, the Secretary of Energy testified before Congress regarding the Yucca Mountain application. While the Secretary signaled the administration's wish to end the Yucca Mountain project, he also indicated that Yucca Mountain's licensing process would continue while other options were considered. Secretary Chu stated that:

> The [FY 2010] budget request includes the minimal funding needed to explore alternatives for nuclear waste disposal through [the Office of Civilian Radioactive Waste Management] *and to continue participation in the Nuclear Regulatory Commission (NRC) license application process, consistent with the provisions of the Nuclear Waste Policy Act*.[7]

Within the last year, then, DOE was not at the point of making an irrevocable policy decision with respect to the Yucca Mountain project. Furthermore, Secretary Chu's testimony came months *after* the date set by this Board for timely intervention.

On February 1, 2010, while presenting DOE's proposed FY 2011 budget, Secretary Chu reversed course and announced that DOE would discontinue its Yucca Mountain licensing effort.[8] On the same day, DOE filed a stay motion before this Board in which it announced its intent to file the pending motion to withdraw its construction authorization with prejudice.[9] With these actions, both of which occurred within the past thirty days, Washington was put on notice of DOE's intent to act on terminating this proceeding. It was not until these events that Washington's good cause to intervene ripened.

The NRC has held that new regulatory developments and the availability of new information may constitute good cause for late intervention. *Duke Power Co.*, (Amendment to

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[7] Statement of Secretary Chu before the Senate Committee on Appropriations, Subcommittee on Energy, and Water Development, and Related Agencies, May 19, 2009, available at http://appropriations.senate.gov/ht-energy.cfm?method=hearings.view&id=95551689-1902-4074-af76-2cfb7f705475. (Emphasis added.)

[8] *President's Energy Budget Invests in Innovation, Clean Energy, and National Security Priorities*, PowerPoint presentation given by Energy Secretary Steven Chu, February 1, 2010, available at http://www.energy.gov/media/Secretary_Chu_2011_Budget_rollout_presentation.pdf.

[9] U.S. Department of Energy's Motion to Stay the Proceeding, Docket No. 63-001 (Feb. 1, 2010).

Materials License SNM-1773 - Transportation of Spent Fuel from Oconee Nuclear Station for Storage at McGuire Nuclear Station), ALAB-528, 9 NRC 146, 148-49 (1979); *Texas Utilities Electric Co.* (Comanche Peak Steam Electric Station Units 1 & 2) , CLI-92-12, 36 NRC 62, 69-73 (1992); *Consumers Power Co.* (Midland Plant, Units 1 & 2), LBP-82-63, 16 NRC 571, 577 (1982). The Board is to look at "when the information became available and when petitioners reasonably should have become aware of that information." *Texas Utilities Electric Co.*, 36 NRC at 69-71. The Board should also consider whether a petitioner has sought leave to intervene as soon as possible after the time specified by the Board. *See Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), LBP-99-3, 49 NRC 40 (1999) (finding that a petition for leave to intervene filed 45 days after petitioner knew of relevant license amendment met the NRC test).

Here, Washington has acted rapidly to request intervention within 30 days of the February 1 announcements. Washington is filing its petition before DOE has even filed its actual motion to withdraw with prejudice. Washington has demonstrated good cause for a late-filed petition to intervene.

2. The Nature and Extent of Washington's Right Under the Act to be Made a Party to the Proceeding [10 C.F.R. § 2.309(c)(1)(ii)]

Washington incorporates by reference the discussion in Section I.A.2, *supra*.

3. The Nature and Extent of Washington's Interest in the Proceeding [10 C.F.R. § 2.309(c)(1)(iii)]

Washington incorporates by reference the discussion in Section I.A.3, *supra*.

4. The Possible Effect of a Decision or Order by the NRC Affecting Washington's Interest [10 C.F.R. § 2.309(c)(1)(iv)]

Washington incorporates by reference the discussion in Section I.A.4, *supra*.

5. The Availability of Other Means Whereby Washington's Interest Will be Protected [10 C.F.R. § 2.309(c)(1)(v)]

Washington has considered legal action in other forums to protect its interests.[10] The NWPA, for instance, provides for judicial review of certain DOE and NRC decisions. 42 U.S.C. § 10139(a)(1)(B). Washington continues to evaluate these options and reserves all rights to seek appropriate relief in other venues. DOE's anticipated withdrawal motion, however, will be filed in this proceeding, before this Board. It is thus only in this proceeding and before this Board that Washington may directly oppose the forthcoming motion from DOE. Other collateral attacks on DOE's motion (and DOE's broader decision to irrevocably abandon the Yucca Mountain project) may not advance Washington's interests as directly as participating in this proceeding.

6. The Extent to Which Washington's Interests will be Represented by Existing Parties [10 C.F.R. § 2.309(c)(1)(vi)]

No existing party to this proceeding has the same interests as Washington. Washington is a sovereign state with a unique interest in the disposition of approximately two-thirds of the nation's defense-related high-level radioactive waste. *See* Section I.A.3, *supra*. Furthermore, other than DOE itself, it appears that only one existing party (the Nuclear Energy Institute (NEI)), has taken positions in this proceeding supporting DOE's application. *See, e.g.,* May 11, 2009 *ASLB Memorandum and Order (Identifying Participants and Admitted Contentions)* at 71-83 (discussing NEI's intervention in support of DOE's application). NEI, however, is an umbrella organization representing commercial nuclear power operators.[11] It does not and cannot act on behalf of Washington's interests. The many other existing parties appear to oppose

[10] As the Board may be aware, other parties have filed actions related to the administration's decision to seek to dismiss this proceeding with prejudice. Aiken County (South Carolina) and individual citizens from Washington state have filed actions in the D.C. Circuit Court of Appeals. The State of South Carolina has filed an action in the 4th Circuit Court of Appeals, in addition to petitioning to intervene in this proceeding.

[11] *See* www.nei.org ("NEI is the policy organization for the nuclear technologies industry").

DOE's application in whole or in part and may support DOE's anticipated motion to withdraw.[12] As a result, no existing party can represent Washington's interests.

7. The Extent to Which Washington's Participation will Broaden the Issues or Delay the Proceeding [10 C.F.R. § 2.309(c)(1)(vii)]

DOE has represented that it will move to withdraw its application with prejudice. U.S. Department of Energy's Motion to Stay the Proceeding, Docket No. 63-001 (Feb. 1, 2010). DOE has therefore put at issue whether it has authority to request such a withdrawal and whether this Board has authority to grant such a motion. Washington's intervention will not broaden these issues. Washington will merely oppose such withdrawal.

Washington's intervention will not delay the proceeding. Washington will comply with all deadlines set by the Board. Washington's intervention comes while this matter is still in the discovery phase and well before any hearing on the merits. As a result, it fits with other cases in which the Board has granted late intervention. *See, e.g., Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), LBP-99-3, 49 NRC 40 (1999) (late intervention by new party unlikely to cause delay where the proceeding was still in the informal discovery stage); *cf. Dominion Nuclear Connecticut*, 62 NRC at 564 (late intervention denied where the proceeding was closed).

8. The Extent to Which Washington's Participation may Reasonably be Expected to Assist in Developing a Sound Record [10 C.F.R. § 2.309(c)(1)(viii)]

As demonstrated by its contentions, Washington will oppose DOE's anticipated motion on multiple grounds, some of which concern the fundamental authority of DOE and this Board to terminate a proceeding that Congress has mandated through the NWPA. Washington's

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[12] See, e.g., U.S. Department of Energy's Motion to Stay the Proceeding at 3 (only White Pine County, Nevada opposed Motion to Stay).

participation will therefore ensure full briefing and argument of whether DOE's motion should be granted. Washington's participation will thus assist the Board as it considers DOE's anticipated motion.

II. CONTENTIONS

In accordance with the Pre-License Application Presiding Officer Board's June 20, 2008, Memorandum and Order (LBP-08-10), Washington submits the following contentions.

Washington notes that these contentions are raised in a different context than the contentions raised in reaction to an already-docketed license application. Here, the contentions relate to a motion not yet filed. Washington is therefore setting forth those contentions it expects will be triggered by the anticipated motion. Because Washington has not yet seen DOE's motion, and in the interest of avoiding prejudice to Washington by disclosing the full detail of its potential arguments in advance of that motion, Washington is unable to provide the level of detail provided in contentions filed in reaction to the license application. Washington reserves its right to advance additional contentions after seeing DOE's motion.

WAS-MISC-001 - UNDER THE NWPA, NEITHER DOE NOR THE NRC HAVE THE DISCRECTION TO TERMINATE THE YUCCA MOUNTAIN LICENSING PROCESS WITH PREJUDICE

1. Statement of the Issue of Law or Fact to be Raised or Controverted

Whether under Section 114 of the NWPA, 42 U.S.C. § 10134(b) and 42 U.S.C. § 10134(d), DOE has authority to withdraw its construction authorization application with prejudice, and whether the NRC has discretion to grant such withdrawal.

2. Brief Explanation of the Basis of This Contention

Through the NWPA, Congress has made the policy choice for the nation that deep geologic disposal is the appropriate method for disposing of high-level radioactive waste and spent nuclear fuel. 42 U.S.C. § 10131(b)(2). In 2002, Congress made a further policy choice for the nation by designating Yucca Mountain as the nation's repository site for such disposal. Approval of Yucca Mountain Site, Pub. L. No. 107-200, 116 Stat. 735 (2002).

Under the stepwise structure of the NWPA, Congress' action in 2002 terminated the discretion formerly vested in DOE through the NWPA's site characterization provisions, Sections 112 and 113 (42 U.S.C. § 10132 and 10133). *See, e.g., Nuclear Energy Inst., Inc. v. Envtl. Prot. Agency*, 373 F.3d 1251, 1302 (D.C. Cir. 2004) ("Congress has settled the matter, and we, no less than the parties, are bound by its decision."). Congress' action shifted the focus under the NWPA from DOE's site characterization and suitability activities to the NRC's licensing process. As noted previously by this Board, "DOE was required to submit an application for a construction authorization to the NRC" based on Congress' action. *U.S. Dep't of Energy* (High Level Waste Repository), LBP-09-6, 69 NRC ___ (May 11, 2009) (slip op) at 27 (emphasis original).

Under Section 114(b) of the NWPA, Congress has commanded that the Secretary "*shall submit* to the Commission an application for a construction authorization for a repository at [Yucca Mountain]. . . ." 42 U.S.C. § 10134(b) (emphasis added). Section 114(d) further provides that "[t]he Commission *shall consider* an application for a construction authorization for all or part of a repository in accordance with the laws applicable to such applications" and "*shall issue a final decision approving or disapproving the issuance of a construction authorization*" within a prescribed timeframe. 42 U.S.C. § 10134(d) (emphasis added).

Taken together, these provisions of Section 114 commit both DOE and NRC to follow through with the construction authorization application process until a decision on the merits is reached by NRC.[13] The specific commands of both provisions leave no room for agency discretion on the matter. As a result, DOE is without authority to withdraw its application with prejudice, and the NRC is without discretion to grant such withdrawal.

Washington does not contend that through actions such as convening the recently-appointed Blue Ribbon Commission on America's Nuclear Future, DOE cannot consider other alternatives to Yucca Mountain, or where appropriate, other alternatives to deep geologic disposal. Washington does not even contend that the Yucca Mountain repository is itself compelled to open under the NWPA. That judgment is properly left to the licensing process currently before the NRC. Washington does contend, however, that unless and until it is amended, the NWPA mandates a licensing process that both DOE and NRC must follow. Neither DOE nor NRC have

[13] Other provisions of Section 114 further reinforce this conclusion. Section 114(e) requires the Secretary to prepare a project decision schedule "that portrays the optimum way to attain the operation of the repository. . . ." 42 U.S.C. § 10134(e)(1). The same section requires that any federal agency that cannot (or does not) comply with a deadline in the project decision schedule must report to Congress. 42 U.S.C. § 10134(e)(2). Congress has further made provision that non-compliance with the project decision schedule may extend the three-year timeline imposed on the NRC to reach its decision on the construction authorization application. *See* 42 U.S.C. § 10134(d).

the legal authority to terminate that licensing process prematurely and in a manner that forever forecloses it.

3. Demonstration That the Issue Raised is Within the Scope of This Proceeding

DOE is expected to move to withdraw its construction authorization application with prejudice, which if granted would terminate this proceeding. To the extent DOE's motion will be within the scope of this proceeding, so too will be Washington's opposition to DOE's motion based on the above contention.

4. Demonstration That the Issue Raised is Material to the Findings the NRC Must Make to Support the Action That is Involved in the Proceeding

DOE's motion will require a ruling from this Board when and if it is filed. Washington's contention goes directly to whether or not DOE's anticipated motion should be granted. As a result, Washington's contention is material to ruling on the motion.

5. Concise Statement of Supporting Facts, Expert Opinions, and References

This issues raised in this contention are exclusively legal in nature, not factual.

6. Information Showing That a Genuine Dispute Exists on a Material Issue of Law or Fact

Washington does not expect to encounter any genuine disputes on material issues of fact in opposing DOE's anticipated motion. The presence of a genuine dispute on a material issue of law is evidenced by DOE's apparent belief that authority lies, through a grant from this Board, for it to withdraw its construction authorization application with prejudice, and Washington's statements in this contention that it does not believe such authority exists.

WAS-MISC-002 – IF THE NWPA DOES NOT PRECLUDE DOE FROM MOVING TO DISMISS ITS APPLICATION WITH PREJUDICE, DOE CANNOT MEET THE BOARD'S REQUIREMENTS FOR DISMISSAL WITH PREJUDICE

1. Statement of the Issue of Law or Fact to be Raised or Controverted

Whether DOE's request to withdraw its construction authorization application with prejudice meets the Board's standards for dismissal with prejudice, as articulated through prior Board decisions.

2. Brief Explanation of the Basis of This Contention

If the Board finds that DOE is not precluded by the NWPA from moving to withdraw its application with prejudice, DOE nevertheless cannot meet the Board's standards for such dismissal. Under this Board's precedent, dismissal of an application "with prejudice" signifies that the merits of the case have been reached and adjudicated. *See Philadelphia Elec. Co.* (Fulton Generating Station, Units 1 and 2), ALAB-657, 14 NRC 967, 973, 978-79 (1981) (citing *Jamison v. Miracle Mile Rambler, Inc.,* 536 F.2d 560, 564 (3rd Cir. 1976) ("A dismissal with prejudice constitutes an adjudication of the merits as fully and completely as if the order had been entered after trial"); *Puerto Rico Elec. Power Auth.* (North Coast Nuclear Plant, Unit 1), ALAB-662, 14 NRC 1125, 1132-1133 (1981) (holding it "highly unusual to dispose of a proceeding on the merits, *i.e., with prejudice*, when in fact the health, safety and environmental merits of the application have not been reached"); *Duke Power Co.* (Perkins Nuclear Station, Units 1, 2, and 3), LBP-82-81, 16 NRC 1128, 1135 (1982) (holding that dismissal with prejudice would amount to an adjudication on the merits); *Yankee Atomic Elec. Co.* (Yankee Nuclear Power Station), LBP-99-27, 50 NRC 45, 51 (1999) (holding that dismissal with prejudice would amount to an adjudication on the merits); *Cincinnati Gas & Elec. Co.* (William H. Zimmer Nuclear Power Station, Unit 1), LBP-84-33, 20 NRC 765, 767-768 (1984) (denying withdrawal with prejudice because "despite years of consideration of both the construction permit and operating license, no final agency decision has been rendered which disapproves these Applicants, this site, or this reactor").

The Board has further held that dismissal with prejudice is a severe sanction which should be reserved for those unusual situations that involve substantial prejudice to the opposing party or to the public interest in general.[14] *Puerto Rico Elec. Power Auth.,* 14 NRC at 1132-33; *Cincinnati Gas & Elec. Co.*, 20 NRC at 767-68; *Yankee Atomic Elec. Co.,* 50 NRC at 51; *LeCompte v. Mr. Chip, Inc.*, 528 F.2d 601, 604 (5th Cir. 1976). The standard enunciated in *Philadelphia Electric Co.* and *Puerto Rico Electric Power Authority* "takes as its underpinning" the recognition that:

> (1) it is highly unusual to dispose of a proceeding on the merits, *i.e., with prejudice*, when in fact the health, safety and environmental merits of the application have not been reached; (2) the effect spent in pursuing a nuclear power plant application at the same site for a second time is presumptively preceded by a judgment, entitled to some credence, that there exists a public interest need for the plant's power; and (3) the number of potentially acceptable sites for a nuclear power plant are perforce limited: they should not be eliminated from further consideration absent good and sufficient reason.

Puerto Rico Elec. Power Auth., 14 NRC at 1133.

These same considerations will be amplified in the case of DOE's anticipated motion. Given Congress' selection of Yucca Mountain as the site for the nation's deep geologic repository (which selection remains in force); the effort and cost already invested in the Yucca Mountain project; the lack of any ready alternatives to deep geologic disposal or Yucca Mountain as a repository site; and the degree to which the interests of those such as Washington

[14] This is consistent with the Federal Rules of Civil Procedure, which favor dismissals without prejudice where no other party will be harmed thereby. Fed. R. Civ. P. 41(a)(1), (2); *LeCompte*, 528 F.2d at 603-604.

would be harmed by a withdrawal with prejudice, DOE cannot show substantial prejudice to a party or to the public interest in general that would occur through a dismissal *without* prejudice.

3. Demonstration That the Issue Raised is Within the Scope of This Proceeding

DOE is expected to move to withdraw its construction authorization application with prejudice, which if granted would terminate this proceeding. To the extent DOE's motion will be within the scope of this proceeding, so too will be Washington's opposition to DOE's motion based on the above contention.

4. Demonstration That the Issue Raised is Material to the Findings the NRC Must Make to Support the Action That is Involved in the Proceeding

DOE's motion will require a ruling from this Board when and if it is filed. Washington's contention goes directly to whether or not DOE's anticipated motion should be granted. As a result, Washington's contention is material to ruling on the motion.

5. Concise Statement of Supporting Facts, Expert Opinions, and References

The issue raised in this contention is primarily legal in nature, not factual. To the extent harm to the interests of Washington is argued in conjunction with this contention, Washington will rely on the attached Affidavit of Suzanne L. Dahl-Crumpler.

6. Information Showing That a Genuine Dispute Exists on a Material Issue of Law or Fact

Washington does not expect to encounter any genuine disputes on material issues of fact in opposing DOE's anticipated motion. The presence of a genuine dispute on a material issue of law is evidenced by DOE's apparent belief that it can satisfy the standard for withdrawing its application with prejudice, and Washington's statements in this contention that it does not believe this standard can be met.

WAS-MISC-003 - DOE DID NOT COMPLY WITH NEPA BEFORE DECIDING TO IRREVOCABLY TERMINATE THE YUCCA MOUNTAIN PROJECT

1. Statement of the Issue of Law or Fact to be Raised or Controverted

Whether DOE's decision to irrevocably terminate the Yucca Mountain project, as expressed through its anticipated motion to withdraw its construction authorization with prejudice, was made without complying with National Environmental Policy Act (NEPA), 42 U.S.C. § 4321.

2. Brief Explanation of the Basis of This Contention

Whether or not DOE is required to comply with NEPA as part of a broader decision to irrevocably terminate the Yucca Mountain project, and if so, whether DOE has in fact complied with NEPA, is germane to whether DOE can lawfully act to terminate its license application with prejudice at this time. Washington questions whether this Board has jurisdiction to evaluate DOE's NEPA compliance with respect to its decision to irrevocably terminate the Yucca Mountain project. However, in the event such jurisdiction lies, and to preclude any future assertion that Washington has waived argument on the issue by failing to raise it before this Board, Washington nevertheless contends as follows.

DOE's decision is a major federal action that has a significant effect on environment within the meaning of NEPA. 42 U.S.C. § 4332(C); 40 C.F.R. §§ 1508.8, 1508.18, 1508.27; *Idaho Sporting Congress v. Thomas*, 137 F.3d 1146, 1149-50 (9th Cir. 1998), *overruled on other grounds by* 537 F.3d 1146 (9th Cir. 2008); *Greenpeace Action v. Franklin*, 14 F.3d 1324, 1332 (9th Cir. 1992). DOE is therefore required to evaluate its decision under NEPA before taking any action to implement the decision. 42 U.S.C. § 4332(C); 40 C.F.R. §§ 1501.2, 1501.3, 1501.4, 1502.3, 1506.1, 1507.1; 10 C.F.R. §§ 1021.210(b), 1021.211; *California ex rel. Lockyer v. U.S. Dep't of Agric.*, 575 F.3d 999, 1012 (9th Cir. 2009). Washington is not aware of DOE conducting any new NEPA analysis, or formally adopting any existing NEPA analysis, in conjunction with its decision to irrevocably terminate the Yucca Mountain project. To the extent DOE might point to the Yucca Mountain *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (February 2002) (YM FEIS) (as supplemented) and its evaluation of a "No Action" alternative, Washington does not concede that the YM FEIS' evaluation of impacts in Washington, and in particular impacts at the Hanford Nuclear Reservation, is sufficient to support what is (in effect) a decision to implement the "No Action" alternative by irrevocably terminating the Yucca Mountain project.[15] Furthermore, no other final EIS evaluates these impacts at Hanford. DOE's broader decision to abandon Yucca Mountain, of which its anticipated motion is one expression, thus violates NEPA and as a result is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law" under the Administrative Procedure Act, 5 U.S.C. § 706(2)(A).

3. Demonstration That the Issue Raised is Within the Scope of This Proceeding

DOE is expected to move to withdraw its construction authorization application with prejudice, which if granted would terminate this proceeding. To the extent DOE's motion will be within the scope of this proceeding, so too will be Washington's opposition to DOE's motion based on the above contention.

[15] This does not suggest that Washington considers the EIS's analysis of the Yucca Mountain alternative to be inadequate to inform NRC's licensing process.

4. Demonstration That the Issue Raised is Material to the Findings the NRC Must Make to Support the Action That is Involved in the Proceeding

DOE's motion will require a ruling from this Board when and if it is filed. Washington's contention goes directly to whether or not DOE's anticipated motion should be granted. As a result, Washington's contention is material to ruling on the motion.

5. Concise Statement of Supporting Facts, Expert Opinions, and References

Washington does not believe that any final EIS prepared under NEPA analyzes the Hanford-related impacts outlined in paragraphs 44-47 of the attached Affidavit of Suzanne L. Dahl-Crumpler. Dahl Aff. ¶ 48. The question of whether an environmental impact statement must be prepared (or otherwise relied upon) under NEPA is primarily legal in nature. *See, e.g., Alaska Wilderness Recreation & Tourism Ass'n v. Morrison*, 67 F.3d 723, 727 (9th Cir. 1995). However, to the extent reliance on any facts is necessary, Washington will rely on the facts alleged in the attached Affidavit of Suzanne L. Dahl-Crumpler.

6. Information Showing That a Genuine Dispute Exists on a Material Issue of Law or Fact

The presence of a genuine dispute is evidenced by DOE's apparent belief that it is legally empowered at this juncture to move forward with a decision to irrevocably terminate the Yucca Mountain project (including moving to withdraw its construction authorization application with prejudice), and Washington's statements in this contention that it does not believe DOE has satisfied NEPA as a procedural prerequisite to implementing such decision.

WAS-MISC-004 - DOE'S DECISION TO IRREVOCABLY TERMINATE THE YUCCA MOUNTAIN PROJECT IS ARBITRARY AND CAPRICIOUS IN VIOLATON OF THE ADMINISTRATIVE PROCEDURE ACT

1. Statement of the Issue of Law or Fact to be Raised or Controverted

Whether DOE's decision to irrevocably terminate the Yucca Mountain project, as expressed through its anticipated motion to withdraw its construction authorization with prejudice, is arbitrary and capricious under the Administrative Procedure Act (APA), 5 U.S.C. § 706(2)(A).

2. Brief Explanation of the Basis of This Contention

Similarly, the question of whether or not DOE has acted arbitrarily and capriciously in reaching a broader decision to irrevocably terminate the Yucca Mountain project is also germane to whether DOE can lawfully act to terminate its license application with prejudice at this time. Again, Washington questions whether this Board has jurisdiction to evaluate whether DOE's decision to irrevocably terminate the Yucca Mountain project amounts to arbitrary and capricious agency action under the standards of the APA. However, in the event such jurisdiction lies, and to preclude any future assertion that Washington has waived argument on the issue by failing to raise it before this Board, Washington nevertheless contends as follows.

DOE's decision to irrevocably terminate the Yucca Mountain project is a "final agency action" within the meaning of the APA, 5 U.S.C. § 704. Through that decision, DOE is undertaking a shift in policy that reverses decades of work, billions of dollars of investment, and settled expectations that have been relied upon across the country, including in Washington. DOE specifically intends to foreclose all future consideration of Yucca Mountain as a deep geologic repository. DOE has failed to articulate a clear rationale based on an administrative record for a decision of this stature, particularly when the NWPA prescribes a course for DOE to be pursuing Yucca Mountain's licensure and particularly when no alternative course has been provided. As a result, DOE's decision is arbitrary and capricious under the APA, 5 U.S.C. § 706(2)(A).

3. Demonstration That the Issue Raised is Within the Scope of This Proceeding

DOE is expected to move to withdraw its construction authorization application with prejudice, which if granted would terminate this proceeding. To the extent DOE's motion will be within the scope of this proceeding, so too will be Washington's opposition to DOE's motion based on the above contention.

4. Demonstration That the Issue Raised is Material to the Findings the NRC Must Make to Support the Action That is Involved in the Proceeding

DOE's motion will require a ruling from this Board when and if it is filed. Washington's contention goes directly to whether or not DOE's anticipated motion should be granted. As a result, Washington's contention is material to ruling on the motion.

5. Concise Statement of Supporting Facts, Expert Opinions, and References

Washington anticipates that the facts supporting this contention (e.g., documenting extensive history of the Yucca Mountain project and expressing current DOE decision to forever terminate that project) are contained in existing documents, many of which are already before this Board. Washington will cite to documents before this Board wherever possible. Where this is not possible, Washington will introduce documents through affidavit of counsel. Washington will also rely on facts alleged in the attached Affidavit of Suzanne L. Dahl-Crumpler.

6. Information Showing That a Genuine Dispute Exists on a Material Issue of Law or Fact

The presence of a genuine dispute is evidenced by DOE's apparent belief moving to withdraw its construction authorization application with prejudice that it has appropriately exercised whatever agency discretion it is afforded under the NWPA, together Washington's statements in this contention that it does not believe DOE has satisfied NEPA as a procedural prerequisite to implementing such decision.

III. CONSULTATION

Pursuant to 10 C.F.R. § 2.323(b), the undersigned counsel have made a good faith effort to consult with counsel for the other parties prior to filing this petition. On March 1, 2010, Washington gave notice by e-mail of its intent to file this motion to all parties and persons on the most current service list for this proceeding. As of noon on March 3, 2010, the result of that consultation is as follows:

The following parties have consented to or indicated they do not oppose the petition: the "Four Nevada Counties" (Mineral, Lander, Churchill, and Esmeralda); NEI; Nye County, Nevada; and White Pine County, Nevada.

The following parties are taking no position on the petition and are reserving their right to respond once the petition is filed: NRC Staff; Joint Timbisha Shoshone Tribal Group; State of Nevada; Clark County, Nevada; Eureka County, Nevada; State of California; and Inyo County, California.

IV. COMPLIANCE WITH 10 C.F.R. § 2.1012(b)(1) AND 10 C.F.R. § 2.1003

Pursuant to 10 C.F.R. § 2.1012(b)(1), a person seeking party status must demonstrate "substantial and timely compliance with the requirements of § 2.1003 at the time it requests participation in the HLW licensing proceeding under § 2.309." 10 C.F.R. § 2.1012(b)(1). The undersigned counsel have made good faith efforts to achieve such substantial and timely compliance. Washington contacted LSN Administrator Daniel J. Graser on March 2, 2010, to discuss the technical requirements for complying with 10 C.F.R. § 2.1003. Mr. Graser has provided Washington with guidance documents outlining these requirements. Washington is proceeding to follow these requirements and has every intention of complying with 10 C.F.R. § 2.1003 as quickly as possible.

V. CONCLUSION

For the foregoing reasons, Washington respectfully requests that its Petition for Leave to Intervene be granted.

DATED this 3rd day of March, 2010.

ROBERT M. MCKENNA
Attorney Genreal

Signed (electronically) by Andrew A. Fitz
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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:	Docket No. 63-001-HLW
U.S. DEPARTMENT OF ENERGY	ASLBP NO. 09-892-HLW-CAB04
(High-Level Waste Repository)	March 3, 2010

AFFIDAVIT OF SUZANNE L. DAHL-CRUMPLER IN SUPPORT OF STATE OF WASHINGTON'S PETITION FOR LEAVE TO INTERVENE

I, Suzanne L. Dahl-Crumpler, swear and affirm under penalty of perjury that the following is true and correct.

1. I am now, and at all times mentioned have been a citizen of the United States, and am a resident of the State of Washington, over the age of eighteen years, competent to make this affidavit, and make this affidavit from my own personal knowledge, judgment, and professional experience.

2. I am and have been employed by the State of Washington, Department of Ecology (Ecology), Nuclear Waste Program, for nearly 15 years, beginning in July 1995. I have a Bachelor of Science in Geology and a Masters of Science in Hydrogeology from Baylor University in Waco, Texas. I have over 20 years of experience in issues related to environmental cleanup, Resource Conservation and Recovery Act (RCRA) implementation, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

implementation, ground water and fate and transport, risk assessments, and National Environmental Policy Act (NEPA) analysis.

3. As an employee of Ecology, I have worked on environmental compliance and cleanup issues related to the Department of Energy's (DOE) Hanford Nuclear Reservation since 1995.

4. I am currently the Nuclear Waste Program's Tank Waste Treatment Section Manager. I have worked in this position for over 2 years. Prior to that, I was the Nuclear Waste Program's Tank Waste Disposal Project Manager and Tank Waste Project Manager for approximately 12 years. In the past, Ecology had all Hanford tank waste issues in one project, which I managed. This included managing issues related to Hanford tank safety resolution, interim stabilization, tank farm operations, tank waste characterization, tank farm upgrades, tank waste retrieval, tank farm closure, characterization of the vadose zone and groundwater beneath the tanks, tank waste treatment, and tank waste disposal and storage after treatment. In my present position, I manage issues related to half of the entire Hanford tank program, which includes tank waste characterization, tank waste treatment, and treated tank waste disposal and storage. I supervise 14 people who work on tank waste treatment and disposal issues.

5. I currently serve as the Nuclear Waste Program's management lead for issues related to DOE's development of the Draft Hanford Tank Closure Waste Management EIS, on which Ecology is a cooperating agency. During the 1995-1997 time frame, I was involved as a key person in developing the Hanford Tank Waste Remediation System EIS (referenced further below), which Ecology co-authored with DOE.

6. For approximately the last decade, I have served as Ecology's expert on high level waste issues. I have interacted with the Nuclear Regulatory Commission (NRC) and National Academy of Sciences on a number of occasions with respect to the classification of the low-activity waste derived from treating high-level waste, and in the possible disposal of "tank heels" that cannot be retrieved from tanks containing high-level waste.

7. In this affidavit, I will describe the Hanford site; Hanford's high-level radioactive tank waste; Hanford's current system for storing that tank waste; the regulatory status of that tank waste; the current plan for treating and disposing of tank waste (including that plan's interrelationship with the Yucca Mountain project); and other spent nuclear fuel and high-level waste at Hanford and within Washington.

A. Hanford Description

8. Hanford is part of the nationwide complex that was used in the production of plutonium for nuclear weapons. The federal government selected the site in the early 1940s as part of the Manhattan Project. It was used extensively throughout the Cold War for the production of weapons-grade plutonium. Weapons production at Hanford ended in 1989, when the mission of the site was changed to cleanup.

9. Hanford structures include nine inactive reactors along the Columbia River, five inactive chemical reprocessing facilities in the central plateau, several spent nuclear fuel storage basins along the Columbia River, the Plutonium Finishing Plant, fuel fabrication facilities, large underground storage tanks located on the central plateau, and many miscellaneous small underground storage tanks.

10. From December 1944 to 1989, Hanford produced about two-thirds of the nation's weapons-useable plutonium. This was accomplished by irradiating uranium fuel in

production reactors located along the Columbia River. The irradiated fuel was then chemically dissolved in separations plants. Plutonium 239 was then processed into metallic oxide form for shipment to other DOE sites for finishing and placement in weapons. Useable uranium extracted in the separations process was recycled into new reactor fuel.

11. The chemical separations plants used varying processes over time. All produced a highly acidic and highly contaminated liquid waste stream that was directed into large underground storage tanks after the waste was neutralized by making the solutions strongly basic. This waste stream ("tank waste") remains at the Hanford site today, with a current volume of approximately 53 million gallons. It is the focus of an ongoing multi-billion dollar cleanup effort, with severe and irreversible environmental consequences hanging in the balance. Because of the nature of the waste and the way it is currently being stored, the cleanup effort is a series of interrelated and interdependent actions, the final piece of which is disposal of immobilized high-level radioactive waste at a deep geologic repository. I will describe these particulars below.

B. Description of Hanford's Tank Waste

12. The radioactive and chemical make up, volume, and consistency of Hanford's tank waste is heterogeneous. It is the product of various processing approaches, the neutralization of the waste with large volumes of sodium hydroxide intended to make the waste compatible with the carbon steel tanks, evaporation campaigns conducted to reduce the volume of waste, and additional reprocessing to recover uranium, cesium, and strontium. The neutralization of waste was done by adding large amounts of sodium hydroxide, which caused the waste to be highly basic and to separate into different radioactive and chemical layers. The evaporation campaigns caused the waste to precipitate and reduce the physical volume, and the

various processing and reprocessing approaches added various chemicals to the waste. The tank waste thus varies widely in physical form from tank-to-tank and within tanks themselves, taking on the forms of vapor, supernate liquid, slurry, sludge, and saltcake with interstitial liquid.

13. Hanford's tank waste can best be described as a witch's brew of a wide range of chemicals and radioactive elements. The waste contains at least 46 identified radionuclides. Because these radionuclides are the result of reprocessing spent nuclear fuel, tank waste is presumptively considered high-level waste under Nuclear Waste Policy Act unless key radionuclides are removed in sufficient concentrations to allow the separated waste to be disposed in something other than a deep geologic repository.

14. In addition, Hanford's tank waste includes at least 26 hazardous waste constituents, including heavy metals and volatile organic compounds. All of these constituents are potentially harmful to human health and the environment. Because of the presence of these hazardous waste constituents, the State of Washington regulates Hanford tank waste as "mixed waste" under Washington's Hazardous Waste Management Act (HWMA), Chapter 70.105 Wash. Rev. Code, and the HWMA's implementing Dangerous Waste Regulations (Wash. Admin. Code [WAC] 173-303). This regulation, in turn, is part of a state hazardous waste program authorized to stand in lieu of federal hazardous waste law under RCRA, 42 U.S.C. § 6926(b). *See* 51 Fed. Reg. 3,782 (1986); 52 Fed. Reg. 35,556 (1987); 55 Fed. Reg. 33,695 (1990); 59 Fed. Reg. 55,322 (1994); and 61 Fed. Reg. 7,736 (1996).

15. All of Hanford's tank waste is considered by Washington to be "land disposal restricted" waste under RCRA and the HWMA. As a result, it must be treated to specified land disposal restriction standards before disposal. WAC 173-303-140(2)(a) (incorporating by

reference 40 C.F.R. § 268.1(b)). However, due to the nature of the radioactive constituents in the waste, there is currently no treatment capacity for tank waste at Hanford. The tank waste instead continues to be stored in violation of the prohibition on storing land disposal restricted waste under the HWMA and RCRA. WAC 173-303-140(2)(a) (incorporating by reference 40 C.F.R. § 268.50).

16. The 53 million gallons of waste in Hanford tank systems accounts for 60 percent of the high-level waste DOE is responsible for nationwide. This is an enormous quantity of waste. As a visual aid, DOE's own documents estimate that if the contents of the tanks were placed within an area with the footprint the size of a football field, they would form a column of high-level waste 150-feet tall.

C. Description of the Hanford Tank Waste System

17. Currently, Hanford's tank waste is largely being stored in 177 underground tanks located in the central portion of the Hanford site. The tanks are grouped in 18 areas or "farms." A tank farm can contain from 2 to 18 tanks with associated pipes, valve pits, and diversion boxes.

18. Of the 177 tanks, 28 are double-shell tanks (DSTs) that currently comply with RCRA and HWMA standards for hazardous waste tanks. The DSTs are buried beneath about seven feet of soil.

19. The remaining 149 tanks are single-shell tanks (SSTs). These tanks were constructed between 1944 and 1964 with an expected operating life of approximately 25 years. The SSTs currently hold approximately 30 million gallons of tank waste. The SSTs are buried beneath 6-11 feet of soil.

20. All 149 SSTs have been identified to the State of Washington by DOE as "unfit for use" pursuant to RCRA and the HWMA (40 C.F.R. § 265.191, incorporated by reference in WAC 173-303-400(3)). *Single Shell Tank System Integrity Assessment Report*, RPP-10435, Revision 0 (June 27, 2002) and transmittal letter from James E. Rasmussen, Energy Office of River Protection, to Michael Wilson, Department of Ecology.

21. An additional significant part of the tank system is the ancillary equipment and the tank waste in that portion of the system. Hanford has the most extensive ancillary equipment system in the nation, and perhaps the world. The ancillary equipment includes 145 miles of pipelines, 61 miscellaneous tanks, 6 vaults, 72 diversion boxes, 26 valve pits, 349 tank pits, 49 other pits, 3 evaporators, and 10 other above ground facilities. The ancillary equipment currently holds a significant portion of high-level waste near the surface (as much as an additional 2.5 million gallons).

22. Near-term action is necessary to retrieve Hanford's tank waste. Numerous Energy documents state that 67 of the 149 SSTs are "known or suspected leakers." *See, e.g., U.S. Department of Energy, Office of River Protection 2-Year Progress Report to Congress*, DOE/ORP-2000-27 (Dec. 2000). The first known leakers were tanks TY-106 and U-101 in 1959. Tank T-106 is listed as having leaked the largest known quantity of waste, 115,000 gallons. Five of the 67 leakers suffered catastrophic failures, defined as either structural failure or loss of 50,000 gallons or more. There are seven tanks that have leaked between 20,000 and 50,000 gallons: C-101, S-104, SX-106, SX-108, TY-105, TY-106, and U-101. There is at least one known or suspected leaker in each tank farm, and 8 of the 12 SST farms contain more than 5 known or suspected leakers. Taken together, the SSTs have leaked an estimated total of approximately 1 million gallons of high-level mixed waste into surrounding soils.

23. These leaks from tanks and associated ancillary equipment have resulted in vadose zone contamination at high concentrations, and some past leaks are already impacting groundwater at levels significantly above drinking water standards in these areas. There is future risk to the public as these contaminants move away from the tank farm areas. Many of the contaminants will be pervasive in the environment for thousands of years to come. It is clear that in some cases, remedial actions will be needed to protect human health and environment from just the past tank leaks alone. Contaminants from past leaks that have migrated to the soil and the groundwater are present in high enough concentrations that it is possible they could migrate to the Columbia River and be present adjacent to the river in concentrations above acceptable limits.

24. Further leaks could occur in the future from both DOE's SST and DST systems. Today, the average SST is 42 years past its design life. As DOE has admitted, future tank failures can be expected as the SSTs exceed their design lives by longer and longer periods. Such leaks may occur during retrieval, and from infiltration of rainwater resolubilizing the tank waste and moving it out the bottom of the tanks or from associated ancillary equipment. In addition, some of the DSTs have exceeded or are approaching the end of their design life and by 2028, most will be at the end of their design life. Future failures in the DSTs can be expected as more of the tanks exceed their design life. For its own planning purposes, DOE has assumed that one DST may fail in 2017 and one additional DST will fail every five years thereafter.

D. Regulatory Status of Tank Waste Retrieval, Treatment, and Disposal

25. To address Hanford's multiple environmental compliance issues, including prolonged storage of high-level waste, the Environmental Protection Agency, and DOE entered

into the Hanford Federal Facility Agreement and Consent Order (HFFACO) in 1989. Among other things, the HFFACO is a compliance order issued pursuant to RCRA and HWMA. HFFACO Article I. The HFFACO establishes numerous milestones (schedules and associated regulatory requirements) for cleanup of the Hanford site and for bringing Hanford facilities into compliance with applicable requirements.

26. These HFFACO milestones include requirements for retrieving waste from and closing the unfit-for-use SST system, and for treating all of Hanford's tank waste to meet RCRA/HWMA land disposal treatment standards. Currently, the HFFACO requires that DOE retrieve high-level waste from all 149 of Hanford's SSTs by 2018 and that it complete the treatment of that waste by 2028.

27. In November 2008, Washington filed suit against the Secretary of Energy and DOE alleging that DOE had missed, or was certain to miss, HFFACO milestones for retrieving waste from SSTs (including the 2018 end date), for constructing and initiating a Waste Treatment Plant (WTP) to begin treating Hanford's tank waste, and for completing treatment of all of Hanford's tank waste by 2028. *Washington v. Chu*, No. CV-08-5085-FVS (U.S.D.C., Eastern District of Washington). A proposed settlement of this case has been reached between Washington and DOE, under which a consent decree would be entered with the district court to govern SST retrieval, WTP construction, and WTP initial operations from the present-to-approximately 2022 timeframe. In addition, the HFFACO would be modified to, among other things, extend the current SST retrieval end date to no later than 2040 and extend the current tank waste treatment end date to no later than 2047. The proposed settlement has undergone public notice-and-comment, but has not yet been executed by the parties.

28. As mentioned above, accomplishing this work—and averting severe environmental consequences—is keyed on a number of interrelated and interdependent actions. In short, retrieving waste from Hanford's SSTs is currently tied to the construction and operation of the WTP complex. The WTP complex, in turn, is being designed and constructed to meet performance standards specific to the Yucca Mountain repository.

E. Plan for Treating and Disposing of Tank Waste

29. Hanford lacks sufficient compliant (DST) storage capacity to allow for the continued uninterrupted retrieval of waste from all of Hanford's SSTs. In fact, there is currently insufficient capacity to allow for the transfer of more than a limited amount of the waste now stored in the SSTs. To date, DOE's strategy for addressing this situation has been to by and large rely on the prospective future treatment capacity of the WTP to remove waste from the DST and SST systems. DOE has expected that over time, this will free up DST capacity, which in turn will allow for the continued transfer of waste retrieved from the SSTs to the DSTs.

30. Under this strategy, the WTP is the lynchpin for completing the Hanford tank waste mission. It is vital to both treating tank waste in satisfaction of RCRA/HWMA treatment standards and creating the "throughput" necessary to allow SSTs to continue being retrieved.

31. The WTP is a $12.3 billion facility, with several major facilities and ancillary support components. Currently, approximately $5.2 billion has already been expended. This includes design, engineering, construction, management costs, and fees.

32. The WTP will consist of four major components: the Pretreatment Facility; the Low Activity Waste Vitrification Facility; the High Level Waste Vitrification Facility; and the Analytical Laboratory (LAB).

33. The Pretreatment (PT) Facility will separate radioactive tank waste into high-level waste and low-activity waste fractions and transfer each waste type to the respective vitrification facility for immobilization. As of December 2009, overall PT Facility completion is at 48 percent; engineering and design is 77 percent complete, and construction is 29 percent complete. The budget for this component of the WTP is $4.09 billion, with $1.97 billion having already been expended.

34. The Low-Activity Waste (LAW) Facility will vitrify low-activity waste from the PT Facility. Waste will be mixed with glass formers, vitrified into glass at an average daily rate of 30 metric tons, and placed in stainless-steel containers that will be disposed on site in the Integrated Disposal Facility. As of December 2009, overall LAW Facility completion is at 68 percent; engineering and design is 92 percent complete, and construction is 57 percent complete. The budget for this component of WTP is $1.68 billion, with $1.14 billion already having been expended.

35. The High-Level Waste (HLW) Facility will receive the high-level waste fraction from the PT Facility. The concentrate is sampled and analyzed to determine the optimum blend of glass formers to add to the waste that will produce a vitrified waste form that is compliant with disposal requirements as outlined in the *Waste Acceptance System Requirements Document,* Revision 5, May 31, 2007, (WASRD) and other relevant documents, and also meets the required production rates. As of December 2009, overall HLW Facility completion is at 49 percent; engineering and design is 83 percent complete, and construction is

24 percent complete. The budget for this component of the WTP is $2.57 billion, with $1.26 billion having already been expended.

36. The Analytical Laboratory (LAB) will support WTP operations by analyzing feed, vitrified waste, and effluent streams. As of December 2009, overall LAB completion is at 48 percent; engineering and design is 79 percent complete; construction is 59 percent complete. The budget for this component of the WTP is $.64 billion, with $.31 billion having already been expended.

37. Upon the conclusion of treatment, the WTP will produce two output streams. The bulk of the chemicals and some of the radioactive elements will be captured in the low-activity fraction (10 percent of the radioactivity and 90 percent of the volume) and vitrified as Immobilized Low Activity Waste (ILAW). ILAW will be disposed on the Hanford site at a facility called the Integrated Disposal Facility. This facility is already constructed.

38. The remaining high-level radioactive fraction (90 percent of the radionuclides and 10 percent of the volume) will be vitrified as Immobilized High Level Waste (IHLW). As further outlined below, Washington and DOE have presumed and planned for IHLW to be disposed of in a deep geologic repository.

39. From the beginning, the WTP treatment approach was developed in consideration of the Nuclear Waste Policy Act. The current basis for ILAW to be disposed in near surface facilities, rather than a deep geologic repository licensed by NRC, comes from a series of technical letters between DOE and the NRC in the 1980s and 1990s. These letters defined that ILAW disposal at Hanford can proceed if, among other things, tank wastes have been processed to remove key radionuclides to maximum extent technically and economically practical based on specific pretreatment, with vitrification of the low activity fraction. The

remaining high level fraction was always assumed to require disposal in a deep geologic repository.

40. This exchange informed development of the 1996 Tank Waste Remediation System (TWRS) EIS and its associated Record of Decision (ROD). The TWRS ROD determined that the tank waste would be treated to generate separate low-activity waste and high-level waste outputs. It further indicated that the high-level waste output, in which the bulk of the radionuclides would be concentrated, would be disposed of offsite in a national geologic repository to permanently isolate the wastes from humans and the environment to the greatest extent practicable and provide for protection of public health and the environment. Attachment 1 at 20-23, 30-33 (62 Fed. Reg. at 8693-95, 8698-700).[1] By act of Congress, this repository is currently sited at Yucca Mountain, Nevada.

41. DOE's subsequent planning documents also assume Hanford's IHLW among the inventories destined for the Yucca Mountain repository. For example, the *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (February 2002) (YM FEIS) assumes IHLW inventories ranging from 8,315 canisters to 22,280 canisters generated from the WTP. This is approximately 63% of the high-level waste planned for disposal at the repository. Attachment 2 at 53 (YM FEIS, Vol. 2, App. A, Section 1.1.4.1 at A-8).[2]

42. Based on this key planning assumption, the WTP has and is being designed and constructed to satisfy performance standards specific to the Yucca Mountain facility. DOE's

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[1] Attached hereto as Attachment 1 is a true and correct copy of the Record of Decision for the Tank Waste Remediation System, Hanford Site, Richland Washington, 62 Fed. Reg. 8693 (Feb. 26, 1997).

[2] Attached hereto as Attachment 2 are true and correct copies of relevant experts from the YM FEIS.

contract to provide design, engineering, and construction services for the WTP facilities specifies that DOE's WASRD is a "primary requirements reference" for the contract's statement of work. Attachment 3 at 70 (WTP Contract at Section C, Item 1.2.1.3 at C-100).[3] The contract further specifies that the WTP and its IHLW output must meet key performance measures defined by the WASRD, including (but not limited to):

- As a general requirement, IHLW must meet the requirements established in the WASRD. Attachment 3 at 71 (Item 1.2.2.1.1, Product and Disposal Requirements, at C-101).

- Specific dimensional requirements of the canister system, to accommodate the final waste-form disposal at the repository. Attachment 3 at 71 (Item 1.2.2.1.2, Canister System, at C-101) .

- Specific weight percent in IHLW of 25 components. Attachment 3 at 72 (Table TS-1.1, Minimum component Limits in High-Level Waste Glass, at C-102)

- Sampling and analysis requirements must support process control, environmental compliance and waste form qualification for DOE approval, based on the WASRD and other source documents. Attachment 3 at 68 (Item (18), Analytical Laboratory Facility Design, at C-50).

43. The WASRD document, in turn, establishes the waste acceptance technical requirements for DOE's Civilian Radioactive Waste Management System, which manages waste destined for disposal at the Yucca Mountain repository. The WASRD is "the agreed upon reference source of waste acceptance criteria to which Federal Waste Custodians must conform for their wastes to be received by the repository." Attachment 4 at 78 (WASRD, Section 1.1 at 1).[4] Among other matters, the waste acceptance elements of the WASRD have been developed to specifically comply with the "applicable provisions of 10 CFR Part 63,

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[3] Attached hereto as Attachment 3 are true and correct copies of relevant excerpts of the WTP Contract DE-AC-AC27-01RV14136 (WTP Contract).

[4] Attached hereto as Attachment 4 are true and correct copies of relevant experts from the *Waste Acceptance System Requirements Document,* Revision 5, May 31, 2007 (WASRD).

‘Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada.’” Attachment 4 at 79 (WASRD, Section 3.1 at 9). For example, the WASRD specifies high-level waste requirements to satisfy Yucca Mountain-specific standards in the following areas:

- Durability and Phase Stability of Vitrified HLW
- HLW Canister Design and Materials of Construction
- Dimensional Envelope for HLW Canisters
- Filled HLW Canister Weights
- Capability to Lift HLW Canisters Vertically with Remote Handling Fixtures
- HLW Canister Sealing
- HLW Canister Labeling
- HLW Canister Drop
- Free Liquid in Canisters Containing HLW
- Radionuclide Content in High-Level Waste
- Criticality Potential in Canisters Containing HLW
- HLW Canister Surface Contamination
- Thermal Output in Canisters Containing HLW

Attachment 4 at 80-83 (WASRD, Section 4.8 at 30-33). In short, the WTP is being built to produce IHLW that conforms to the Yucca Mountain-specific standards established by the NRC in 10 C.F.R. pt. 63.

44. Given the degree to which the WTP design and construction is tied to performance standards specific to Yucca Mountain, termination of the Yucca Mountain project would create significant uncertainty in Hanford’s tank waste treatment and disposal mission. Due to the overall completion status of WTP (overall completion is at 52 percent; design and engineering is 78 percent complete, and construction is 48 percent complete), the ability to alter design and construction of the complex is significantly foreclosed. The systems and components of the PT Facility, HLW Facility, and LAB are sufficiently complete to support the processing of high-level waste to meet disposal requirements outlined in the WASRD and

other relevant documents. If the Yucca Mountain repository is terminated, significant regulatory, administrative, and technical issues will have to be revisited at Hanford. This could result in a construction tear-down and rebuild of the WTP to accommodate design and engineering changes necessary to meet another repository's waste acceptance criteria, with significant impacts to cost, scope, and the legally-binding compliance schedule overseen by Washington. Absent such changes, IHLW produced to satisfy Yucca Mountain-specific standards could become stranded at Hanford.

45. Termination (or significant delay) of the Yucca Mountain project would have other effects at Hanford. For the last several years, the plan for storing IHLW at Hanford has been to build a single integrated storage and shipping facility with only enough capacity to service a "just in time" approach that links IHLW production with interim storage and shipping. If a deep geologic repository is terminated or significantly delayed, DOE has indicated that a total of five IHLW storage facilities will need to be built to contain approximately 12,000 IHLW canisters. Attachment 5 at 102 (Draft TC&WM EIS, Readers Guide at 5, Table 4 at 22).[5] Once vitrified, IHLW is not amenable to any further reprocessing. If the waste was to remain stored at Hanford past the design life of the interim IHLW storage facilities (60 years), further replacement interim IHLW storage facilities would need to be constructed. Attachment 5 at 101 (Draft TC&WM EIS, Readers Guide at 11).

F. Other Hanford Spent Nuclear Fuel and High-Level Waste

46. In addition to the tank waste described above, there are more than 2,000 metric tons of spent nuclear fuel currently being stored at Hanford and assumed by DOE for disposal

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[5] Attached hereto as Attachment 5 are true and correct copies of relevant experts from the *Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington* (Draft TC&WM EIS) (Oct. 2009).

at the Yucca Mountain repository. Attachment 2 at 58 (YM FEIS, Vol. 2, App. A, Section A.2.2.3, Table A-20 at A-27). This amount includes not only spent fuel, but fuel that is failed and broken in various stages of decay (e.g., sludge form) after years of storage in cooling basins. Termination (or significant delay) of the Yucca Mountain project would affect the disposition of this waste.

47. Further, there are 1,335 capsules of cesium and 601 capsules of strontium currently stored at Hanford in the Waste Encapsulation Storage Facility. These capsules are considered high-level waste and must be disposed of in a deep geologic repository. DOE has included the capsules in the Hanford IHLW inventory destined for the Yucca Mountain repository described in Paragraph 41 above. The current plan is to either vitrify the capsules through the WTP (adding 340 IHLW canisters to the WTP's output), or find a way to ship them directly to a deep geologic repository. If additional canisters from the WTP are produced, the canisters would also need to be interim stored before being shipped to the repository. Without a deep geologic repository, Hanford and Washington are faced with indefinite long term storage of spent nuclear fuel, cesium and strontium capsules, and IHLW without a final disposal path identified. Termination (or significant delay) of the Yucca Mountain project would affect the disposition of this waste.

48. To the best of my knowledge, no final EIS prepared under NEPA analyzes the Hanford related impacts outlined in Paragraphs 44-47 above in the event the Yucca Mountain project is terminated or significantly delayed.

49. Finally, I am aware that approximately 581 metric tons of spent nuclear fuel (projected) is being stored at the Columbia Generating Station, a commercial nuclear power facility operated by Energy Northwest on land leased within the Hanford Reservation. DOE

has included this waste among the inventories destined for the Yucca Mountain repository. Attachment 2 at 55 (YM FEIS, Vol. 2, App. A, Section A.1.1.4.1 Table A-7 at A-15). Termination (or significant delay) of the Yucca Mountain project would thus presumptively affect the disposition of this waste.

DATED this 3 day of March 2010, in Richland, Washington.

SUZANNE L. DAHL- CRUMPLER
Tank Waste Treatment Section Manager
Executed in Accord with 10 C.F.R. 2.304(d)
State of Washington
Department of Ecology
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Subscribed and sworn to before me on MARCH 3, 2010 by Suzanne L. Dahl-Crumpler.

CORINA MANZANO
NOTARY PUBLIC
COMMISSION EXPIRES 9-20-12
STATE OF WASHINGTON

Notary Public in and for the State of
Washington, residing at BENTON COUNTY.
My appointment expires 09/20/2012.

Attachment 1

Record of Decision
62 Fed. Reg. 8693

NOTICES

DEPARTMENT OF ENERGY

Record of Decision for the Tank Waste Remediation System, Hanford Site, Richland, WA

Wednesday, February 26, 1997

***8693** AGENCY: Department of Energy.

ACTION: Record of decision.

SUMMARY: This Record of Decision addresses actions by the U.S. Department of Energy (DOE) to manage and dispose of radioactive, hazardous, and mixed waste within the Tank Waste Remediation System (TWRS) program at the Hanford Site in southeastern Washington State. DOE, in cooperation with the Washington State Department of Ecology (Ecology), issued a Final Environmental Impact Statement (EIS) entitled "Tank Waste Remediation System, Hanford Site, Richland, Washington, Final Environmental Impact Statement" (TWRS EIS) (DOE/EIS-0189, August 1996). The Final EIS evaluates alternatives for the management and disposal of mixed, radioactive, and hazardous waste currently stored or projected to be stored in 177 underground storage tanks and approximately 60 active and inactive miscellaneous underground storage tanks associated with the Hanford Site's tank farm operations, as well as the management and disposal of approximately 1,930 cesium and strontium capsules currently stored at the Hanford Site.

Based on the environmental impact analysis of the Final EIS and after evaluating costs, regulatory compliance requirements, technical uncertainties, worker and public health and safety, and public, agency, National Research Council, and Tribal Nation comments, DOE has decided to implement the preferred alternative identified in the Final EIS for retrieval, treatment, and disposal of tank waste the, "Phased Implementation alternative" and to defer the decision on disposition of cesium and strontium capsules.

The Phased Implementation alternative was selected because it provides a balance among short-and long-term environmental impacts, meets all regulatory requirements, addresses the technical uncertainties associated with remediation, and provides the flexibility necessary to accommodate future changes in the remediation plans in response to new information and technology development.

While carrying out this decision, DOE will continually evaluate new information relative to the tank waste remediation program. DOE will also conduct periodic independent scientific and technical expert reviews, which DOE believes are essential to the success of the TWRS program. Further, DOE intends to conduct formal evaluations of new information relevant to the tank waste remediation program at three key points over the next eight years under its National Environmental Policy Act (NEPA) regulations (10 CFR 1021.314), with an appropriate level of public involvement, to ensure that DOE stays on a correct course for managing and remediating the tank waste. Various informal reviews also will be conducted during this period.

DOE has decided to defer action on the cesium and strontium capsules to further evaluate potential beneficial uses of the capsules and study potential long-term environmental impacts. The capsules will continue to be managed in the Hanford Site Waste Encapsulation and Storage Facility. DOE will complete an evaluation for poten-

tial future uses of the capsules within two years and will issue a Cesium and Strontium Management Plan that will address alternatives for beneficial uses. If no future uses are found and DOE determines that the capsules should be disposed of, DOE will select an alternative for disposal of the capsules and supplement this Record of Decision.

ADDRESSES: Addresses of DOE Public Reading Rooms and Information Repositories where the Final EIS, Record of Decision, and other relevant information are available for public review are listed at the end of this Record of Decision. The Final EIS and Record of Decision are also available for review on the Internet at www.hanford.gov/eis/twrseis.htm and on the DOE NEPA Web page (http://tis-nt.eh.doe.gov/nepa).

FOR FURTHER INFORMATION: Requests for copies of the Record of Decision or further information on the Final EIS or Record of Decision should be directed to Carolyn Haass, DOE Tank Waste Remediation System EIS NEPA Document Manager, U.S. Department of Energy, Richland Operations Office, P.O. Box 1249, Richland, WA 99352. Ms. Haass may be contacted by telephone at (509) 372-2731. Information on the DOE NEPA process may be requested from Carol M. Borgstrom, Director, Office of NEPA Policy and Assistance (EH-42), U.S. Department of Energy, 1000 Independence Avenue S.W., Washington, D.C. 20585. Ms. Borgstrom may be contacted by telephone at (202) 586-4600, or by leaving a message at (800) 472-2756.***8694**

SUPPLEMENTARY AGENCY INFORMATION:

Purpose and Need for Action

This Record of Decision addresses actions by DOE to manage and dispose of radioactive, hazardous, and mixed waste within the Tank Waste Remediation System (TWRS) program at the Hanford Site in southeastern Washington State. The waste includes approximately 212 million liters (56 million gallons) of waste stored or to be stored in underground storage tanks at the Hanford Site. DOE also will manage the cesium and strontium salts contained in approximately 1,930 capsules currently stored at the Site and, if they are determined to be waste, will dispose of the capsules. The tank waste and cesium and strontium capsules currently pose a low short-term risk to human health and the environment; however, storage costs are high, and the potential for an accident resulting in large releases of radioactive and chemical contaminants will increase as the facilities age.

DOE must implement long-term actions to safely manage and dispose of the tank waste, associated miscellaneous underground storage tanks, and the cesium and strontium capsules (if the cesium and strontium are determined to be waste) to permanently reduce potential risk to human health and the environment. These actions also are needed to ensure compliance with all applicable Federal and Washington State requirements regarding the management and disposal of radioactive, hazardous, and mixed waste.

Alternatives Considered in the Final EIS

The following describes the alternatives considered in the Final EIS and a discussion of their advantages and disadvantages.

In order to compare the alternatives for both the high- and low-activity fractions of the waste, vitrification was used as a representative technology to conduct the EIS analysis. DOE currently plans to implement parts of the Phased Implementation alternative through a privatization initiative whereby private companies will perform certain aspects of the remediation in an effort to use competition within the marketplace to bring new ideas and concepts to waste remediation and reduce project costs. Under current plans, the selected private companies will have the responsibility to treat the high-level waste using vitrification, and will have the option to immobilize the low-activity waste by either vitrification or other similar immobilization methods provided that the final waste form meets regulatory requirements. (DOE has issued contracts to two companies to design tank waste treatment facilities—both companies had proposed vitrifying low-activity waste.)

Tank Waste Alternatives Considered

Phased Implementation (Preferred Alternative)

The Phased Implementation alternative was identified in the Final EIS as the Preferred Alternative. Under the Phased Implementation alternative, the tank waste would continue to be safely stored until the waste is retrieved from the tanks for treatment and disposal by implementing a demonstration phase (Phase I) to verify that the treatment processes will function effectively and then by implementing a full-scale production phase (Phase II).

During Phases I and II, continued operations of the tank farm system and actions to address safety and regulatory compliance issues would be performed and would include:

- Upgrading tank farm infrastructure, including waste transfer, instrumentation, ventilation, and electrical systems;

- Monitoring tanks and equipment to support waste management and regulatory compliance requirements;

- Combining compatible waste types, interim stabilization of single-shell tank waste, continuing waste characterization, removing pumpable liquid from single-shell tanks, transferring newly generated waste from ongoing Site activities to double-shell tanks, operating the 242-A Evaporator and the Effluent Treatment Facility, and performing mitigative actions to resolve tank safety issues;

- Using rail or tanker truck systems to transport waste to the tank farms;

- Completing construction of and operating the new replacement cross-site transfer system to facilitate regulatory compliant waste transfers from 200 West to 200 East Area and continue operating the existing transfer pipeline system until the replacement system is operational; and

- Installing and operating an initial tank waste retrieval system to improve the capacity to consolidate double-shell tank waste and support mitigation of safety issues.

Phase I activities (Part A, development activities; Part B demonstration) activities would last for approximately 10 years and would include:

- Constructing demonstration-scale facilities to produce vitrified low-activity waste and vitrified high-level waste for future disposal;

- Installing and operating tank retrieval systems to retrieve selected waste (primarily liquid waste) for separations and immobilization, and selected tank waste for high-level waste vitrification;

- Transferring liquid waste to receiver tanks and transferring selected waste for high-level waste processing directly to the high-level waste facility;

- Performing separations to remove selected radionuclides (e.g., cesium) from the low-activity waste stream;

- Storing separated high-level waste at the treatment facilities or in the Canister Storage Building pending future high-level waste treatment;

- Returning a portion of the sludge, strontium, and transuranic waste from separations processes to the double-shell tanks for future retrieval and treatment during Phase II;

- Vitrifying the low-activity waste and high-level waste; and

- Transporting the low and high activity wastes to onsite interim storage facilities.

Phase II (full-scale production) activities would begin after completion of Phase I, last for approximately 30 years and would include:

- Constructing full-scale facilities to vitrify low-activity waste and vitrify high-level waste;

- Installing and operating tank retrieval systems to retrieve waste from all single-shell tanks, double-shell tanks, and miscellaneous underground storage tanks;

- Pretreating the waste by sludge washing and enhanced sludge washing followed by separations of the liquid and solids;

- Performing separations to remove selected radionuclides from the low-activity waste feed stream and transferring the waste to the high-level waste vitrification facility;

- Vitrifying the high-level waste stream and the low-activity waste stream;

- Packaging the high-level waste in canisters for onsite interim storage and future shipment to a national geologic repository; and

- Placing the immobilized low-activity waste in containers and placing the containers in onsite near-surface disposal facilities.

DOE also would continue to characterize the tank waste and perform technology development activities to reduce uncertainties associated with remediation, evaluate emerging technologies, and resolve regulatory compliance issues.

The principal advantages of the Phased Implementation alternative are ***8695** that it provides for retrieval of the waste, separation of the high- and low-activity waste constituents and immobilization of the waste. Separations processes would reduce the volume of high-level waste and eliminate the bulk of the contaminants in the low-activity waste stream. This alternative would permanently isolate the wastes from humans and the environment to the greatest extent practicable and provide for protection of public health and the environment by disposing of the bulk of the radionuclides offsite in a national geologic repository and isolating the low-activity waste through immobilization and disposal in onsite facilities. By using a phased approach, DOE will obtain additional information concerning the uncertainties associated with waste characteristics and the effectiveness of the retrieval, separations, and treatment technologies prior to constructing and operating full-scale facilities. Lessons learned from the demonstration phase, ongoing waste characterization, and technology development activities would be applied to Phase II, which may substantially improve the operating efficiency of the second phase and reduce construction and operating costs.

The principal disadvantage of this alternative is that it would involve slightly higher short-term impacts than the in situ and combination alternatives, though lower than the continued management alternatives. Short-term impacts include potential health impacts during Phases I and II from occupational, operational, and transportation accidents and radiation exposures to workers during normal operations. In addition, this alternative would disturb shrub-steppe habitat and may cause a short-term strain on public services during construction activities. This alternative would also cost more than the in situ alternatives.

Other Tank Waste Alternatives Considered

The Final EIS analyzed nine other alternatives for the tank waste. All of the alternatives considered include continuing the current tank farm operations to maintain the tanks and associated facilities until they are no longer needed for waste management. All of the alternatives (except No Action) include upgrading tank farm systems as identified for the Phased Implementation alternative. The following are the other alternatives addressed.

1. No Action

Perform minimum activities required for safe and secure management of the Hanford Site's tank waste with the current tank farm configuration during a 100-year period. This alternative would provide for continued storage and monitoring of tank waste. No construction or remediation activities would be performed under the No Action alternative.

The principal advantage of this alternative is that the short-term environmental impacts would be lower than other alternatives analyzed (except operational accidents which would be high due to the assumed 100-year operating period). The cost estimated for this alternative would be lower than most other alternatives. The degree of technical uncertainty associated with this alternative is low because it is a continuation of ongoing activities. Selection of this alternative would also allow time to develop new waste remediation technologies.

The principal disadvantage of this alternative is that it would result in the highest long-term environmental impacts. Because no action would be taken to immobilize or isolate the waste, the contaminants in the waste would migrate to the groundwater in a relatively short period of time, resulting in contamination of the groundwater far above accepted safe levels and drinking water standards. Persons consuming this contaminated groundwater would have a significant risk of contracting cancer. In addition, this alternative would not meet waste disposal laws, regulations, and policies. This alternative eventually would result in continued deterioration of the structural integrity of the tanks and an increased risk that an earthquake would cause a catastrophic release of tank contents to the environment and the potential for a large number of fatalities. Because all of the waste would remain in the tanks in an unstabilized form, there would be a significant human health risk to inadvertent intruders into the waste after any loss of administrative control of the Site.

2. Long-Term Management

Perform minimum activities required for safe and secure management of the Hanford Site's tank waste during the 100-year administrative control period. This alternative is similar to the No Action alternative, except that the waste transfer system would be upgraded and the double-shell tanks would be replaced twice during the assumed 100-year administrative control period to prevent the potential leakage of large volumes of liquid to the environment from the double-shell tanks. No waste remediation would be performed under this alternative.

The principal advantage of this alternative is the same as for the No Action alternative except that leaching of contaminants into the groundwater from the double-shell tanks would be delayed by 100 years due to the tank replacement program.

The principal disadvantages of this alternative are the same as for the No Action alternative except that the long-term impacts to the groundwater would be slightly lower than the No Action alternative.

3. In Situ Fill and Cap

Retrieve and evaporate liquid waste from the double-shell tanks, fill single-and double-shell tanks with gravel, fill miscellaneous tanks and ancillary equipment with grout, and cover the tank farms with a low permeability earthen surface barrier, disposing of all tank waste onsite.

The principal advantages of this alternative are that the short-term environmental impacts (accident fatalities, radiation exposures, and shrub-steppe habitat disturbance) would be low and the estimated cost would be lower than for all other alternatives. The degree of technical uncertainty associated with this alternative is low because it involves applying common technology, which has a high probability of achieving its projected level of effectiveness for most tanks.

The principal disadvantages of this alternative are that it would have relatively high long-term environmental impacts due to contaminants leaching into the groundwater where they could expose persons who might consume the groundwater, and it would not meet waste disposal laws, regulations, or policies. Because the actions taken for this alternative involve isolation but not immobilization of the waste, the contaminants would migrate to the groundwater over a long period of time and result in significant long-term impacts on public health and the environment. In addition, this alternative may not be feasible for those tanks that generate high levels of flammable gases because of the potential for sparks causing a fire in the tanks while filling with gravel. Other types of fill material may be necessary for these tanks. Because all of the waste except the liquid waste in the double-shell tanks would remain in the tanks in an unstabilized form, there would be a significant human health risk to inadvertent intruders into the waste ***8696** after any loss of administrative control of the Site.

4. In Situ Vitrification

Retrieve and evaporate liquid waste from the double-shell tanks, fill the tanks with sand, vitrify (melt to form glass) all of the tanks in place, and cover all of the tank farms with an earthen surface barrier to dispose of all tank waste onsite. This alternative would involve constructing tank farm confinement facilities to contain and collect the off-gasses generated during the vitrification process. The waste, tanks, and soil surrounding the tanks (including miscellaneous underground storage tanks) would be vitrified by using electricity to melt the soil and waste, which would solidify into a glass when cooled.

The principal advantages of this alternative are that the short- and long-term impacts would be relatively low. The short-term impacts such as occupational, operational, and transportation accidents would be lower because fewer personnel would be required to construct and operate the in situ vitrification systems. The long-term impacts would be low because the contaminants would be immobilized in glass, which would limit the leaching of contaminants to the groundwater.

The principal disadvantages of this alternative are that there is a high degree of technical uncertainty that the alternative would function as intended, and that, even if technically successful, would not produce a final waste form that would meet waste disposal laws, regulations, or policies. In situ vitrification has been performed on contaminated soil, but has not been used on the tank waste or at the scale needed to vitrify the large tanks.

5. Ex Situ No Separations

Retrieve waste from the single-shell, double-shell, and miscellaneous underground storage tanks, either vitrify or calcine (heat to temperatures below the melting point) the waste, and package the treated waste for interim onsite storage and eventual offsite disposal at a national geologic repository.

The principal advantages of this alternative are that the vitrification option would meet all regulatory requirements and both the vitrification and calcination options would result in disposal of all retrieved waste offsite at a national geologic repository. Because this alternative does not involve separations, the technical uncertainties are fewer than those associated with other ex situ alternatives that involve intermediate or extensive separations.

The principal disadvantages of this alternative are that the waste form (either soda-lime glass for vitrification or compacted powder for calcination) may not meet the current waste acceptance criteria at a national geologic repository and the volume of waste to be disposed of at a national geologic repository would be very large and would likely exceed the capacity of the first repository. The costs associated with disposing of all the waste at a national geologic repository make this the most expensive alternative.

6. Ex Situ Intermediate Separations

Retrieve waste from the single-shell, double-shell, and miscellaneous underground storage tanks and separate the waste into high-level and low-activity waste streams using sludge washing, enhanced sludge washing, and ion exchange, then vitrify the waste streams in separate facilities. Dispose of the low-activity waste onsite and the high-level waste offsite at a national geologic repository.

The principal advantages of this alternative are that it would meet all regulatory requirements and result in relatively low long-term impacts because the high-level waste would be disposed of offsite in a national geologic repository and the low-activity waste onsite would be immobilized and isolated in onsite disposal facilities covered with an earthen barrier.

The principal disadvantage of this alternative is that it involves a moderate level of technical uncertainty because the alternative would involve construction and operation of treatment facilities where some of the proposed technologies are first-of-a-kind or have not been demonstrated on Hanford Site tank waste. This alternative would involve a potential for higher short-term impacts than the in situ alternatives because of the nature and extent of the activities required for construction and operation of the full-scale waste treatment facilities. These impacts would include potential health impacts from occupational, operational, and transportation accidents and radiation exposures during normal operations.

7. Ex Situ Extensive Separations

Retrieve waste from the single-shell, double-shell, and miscellaneous underground storage tank waste and use a large number of complex chemical separations processes to separate the high-level waste components from the recovered tank waste. Vitrify the waste streams in separate facilities and dispose of the low-activity waste onsite and the high-level waste offsite at a national geologic repository.

The principal advantages of this alternative are that it would meet all regulatory requirements and, due to the extensive separations processes, would result in the smallest volume of high-level waste for offsite disposal. Due to the extent of the separations processes, the low-activity waste that would remain onsite would have lower radioactive contaminant concentrations than the other ex situ alternatives.

The principal disadvantages of this alternative are that it involves the highest degree of technical uncertainty and highest treatment cost among the ex situ alternatives because of the numerous complex separations processes. This alternative would involve slightly higher short-term impacts than the in situ and combination alternatives, though lower short-term impacts than the continued management alternatives. These impacts include potential health impacts from occupational, operational, and transportation accidents and radiation exposures during normal operations.

8. and 9. Ex Situ/In Situ Combination 1 (Alternative 8) Ex Situ/In Situ Combination 2 (Alternative 9)

Retrieve tank waste (approximately 50 percent of the waste volume for the Combination 1 alternative and 30 percent for the Combination 2 alternative based on long-term risks the contents of the various tanks pose to human health and the environment); separate the retrieved waste into high-level and low-activity waste streams using an intermediate level of separations; then vitrify the waste streams in separate facilities. Dispose of the low-activity waste onsite and the high-level waste at an offsite national geologic repository. Waste in tanks not selected for retrieval would be remediated identical to the In Situ Fill and Cap alternative.

The principal advantage of these alternatives is that they offer the opportunity to lower the remediation cost by remediating the waste in selected tanks based on waste characteristics and contribution to post-remediation risk. The waste that provides the greatest long-term potential human health risks would be remediated. The Combination 2 alternative would have lower remediation costs than the Combination 1 alternative because a smaller volume of waste would be processed. These alternatives would result in short-term impacts (occupational, operational, and transportation accidents and shrub-steppe habitat disturbance) that are generally lower than those for the ex situ alternatives because smaller ***8697** facilities and fewer personnel would be required to process a smaller volume of waste.

The principal disadvantages of these alternatives are that they would not meet waste disposal laws, regulations, and policies. The ex situ portion of these alternatives would have the same technical uncertainties as the Ex Situ Intermediate Separations alternative. The in situ portion of these alternatives would result in higher long-term impacts than the ex situ alternatives because the waste disposed of in situ would leach contaminants into the groundwater over a long period of time and expose persons who might consume the groundwater. The Combination 2 alternative would leave more waste disposed of in situ and result in higher long-term impacts than the Combination 1 alternative.

Environmentally Preferable Alternative—Tank Waste

Identifying environmental preferences among alternatives for the tank waste remediation program requires consideration of the short-term human health and environmental impacts, long-term human health and environmental impacts, and the associated uncertainties in the impact assessment process, including technology performance. There are alternatives that would result in low short-term impacts but relatively high long-term impacts, and identifying the environmentally preferable alternative(s) requires judgment concerning these impacts. Comparing short-term human health impacts with long-term human health impacts is complicated by the fact that short-term impacts can be estimated with a greater degree of certainty than long-term human health risks.

In making these comparisons, DOE considered that most estimated short-term impacts involve risks to workers during remediation that are voluntary and can be reduced by applying appropriate worker protection measures. In contrast, the estimated long-term impacts are involuntary in nature because they would result from inadvertent exposure of future populations to contaminant releases.

The In Situ Vitrification alternative would have lower human health and environmental impacts than the other alternatives, if this technology functioned adequately. This alternative would result in the lowest potential short-term human health impacts, other than the In Situ Fill and Cap alternative, and the lowest long-term human health and environmental impacts. However, in situ vitrification has never been performed at the scale necessary to remediate the Hanford tank waste and there is a high degree of technical uncertainty associated with this alternative. Even with extensive technology research and testing, it may not be feasible to develop this technology to the extent that it would function adequately. If this alternative did not function as designed, the long-term impacts on groundwater and future users of the groundwater would be higher. While the In Situ Fill and Cap alternative would result in the lowest short-term impacts, it also would have significant long-term impacts on the groundwater and future users of the groundwater.

On balance, the ex situ alternatives are environmentally preferable to in situ alternatives because they provide for the permanent isolation of contaminants from the human environment. Among the ex situ alternatives, Phased Implementation is environmentally preferable because it offers the best potential to reduce technology risks and uncertainties relevant to both short-term and long-term impacts, while also providing for treatment and disposal of tank wastes to the greatest extent technically and economically practicable.

Cesium and Strontium Capsules Alternatives Considered

For the purposes of analyzing impacts in the TWRS EIS, it was assumed that the cesium and strontium capsules will remain in the Waste Encapsulation and Storage Facility at the Hanford Site until ready for final disposition. The Waste Encapsulation and Storage Facility is being isolated from B Plant, which previously provided waste handling and utility support. B Plant is scheduled for deactivation.

No Action

No Action was identified in the Final EIS as the preferred alternative and includes the continued storage of the capsules in the Hanford Site Waste Encapsulation and Storage Facility for 10 years. The cesium and strontium capsules are currently classified as byproduct material and are therefore available for beneficial uses. If beneficial uses cannot be found, the capsules may be subject to management and disposal actions as high-level waste.

The principal advantage of the No Action alternative is that it allows DOE to evaluate potential commercial and medical uses for the cesium and strontium capsules rather than foreclosing these options by implementing a disposal alternative. This alternative also provides an opportunity for further study of long-term environmental impacts. DOE would reevaluate the preferred alternative after a determination is made on the potential for future use of cesium and strontium capsules.

The principal disadvantage of this alternative is that it would not result in the near-term disposal of the capsules. The high costs of storing the capsules would continue. The cost and impacts of disposal would be delayed until some time in the future, if appropriate uses for the capsules are not developed.

Onsite Disposal

Overpack the cesium and strontium capsules in canisters and dispose of them onsite in a newly constructed shallow drywell disposal facility.

The principal advantage of this alternative is that it is the only alternative that would allow near-term disposal of the capsules because it would not rely on the construction of a national geologic high-level waste repository, which may not be available until after the year 2015.

The principal disadvantage of this alternative is that it would not meet the requirements of the Resource Conservation and Recovery Act for hazardous waste or DOE policy for disposal of readily retrievable high-level waste. The capsules would be disposed of in a near-surface facility where they would be more accessible to inadvertent human intrusion until the cesium and strontium decayed to non-radioactive elements.

Overpack and Ship

Overpack the cesium and strontium capsules into canisters, place the canisters into Hanford Multi-Purpose Canisters for interim storage, and store the packaged capsules onsite pending offsite disposal at a national geologic repository.

The principal advantage of this alternative is that it would provide for offsite disposal of the capsules in compliance with all regulatory requirements.

The principal disadvantage of this alternative is that the capsules may not meet waste acceptance criteria at a national geologic repository.

Vitrify With Tank Waste

Remove capsule contents, vitrify with the high-level tank waste, and dispose of offsite at a national geologic repository.

The principal advantages of this alternative are that it would meet all regulatory requirements and the currently planned waste acceptance requirements for a national geologic repository. This alternative is dependent ***8698** on selecting one of the tank waste alternatives that includes a high-level waste vitrification facility, which would be used to vitrify the cesium and strontium.

Environmentally Preferable Alternative—Cesium and Strontium Capsules

All of the alternatives for remediation of the cesium and strontium capsules are estimated to result in low environmental impacts. There would be no occupational fatalities or increased incidences of cancer or fatal chemical exposures associated with normal operations. There would be no or low adverse impacts on surface waters or groundwater, soils, air quality, transportation networks, noise levels, visual resources, socioeconomic conditions, resource availability, or land use. The No Action, Overpack and Ship, and Vitrify with Tank Waste alternatives would have slightly lower impacts on shrub-steppe habitats than the Onsite Disposal alternative and a slightly lower risk of a fatal accident. Assuming that the capsules would meet waste acceptance criteria at a national geologic repository the Overpack and Ship alternative would result in slightly lower impacts than the other alternatives and is therefore the environmentally preferable alternative.

Decision

Tank Waste

Description of Alternative Selected

DOE has decided to implement the Phased Implementation alternative for the tank waste. The Phased Implementation alternative strikes an appropriate balance among potential short- and long-term environmental impacts, stakeholder interests, regulatory requirements and agreements, costs, managing technical uncertainties, and the recommendations received from other interested parties.

While carrying out this decision, DOE will continually evaluate new information relative to the tank waste remediation program. DOE also intends to conduct formal evaluations of new information relative to the tank waste remediation program at three key points over the next eight years under its NEPA regulations (10 CFR 1021.314), with an appropriate level of public involvement, to ensure that DOE stays on a correct course for managing and remediating the waste.

As remediation proceeds in the coming years, DOE will learn more about management and remediation of the tank waste and ways to protect public and worker health and the environment. Within this time frame, DOE will obtain additional information on the effectiveness of retrieval technologies, characteristics of the tank wastes, effectiveness of waste separation and immobilization techniques, and more definitive data on the costs of retrieval, separations, and immobilization of the waste. Formal reevaluations will incorporate the latest information on these topics. DOE will conduct these formal evaluations of the entire TWRS program at the following stages: (1) before proceeding into Privatization Phase I Part B (scheduled for May 1998); (2) prior to the start of hot operations of Privatization Phase I Part B (scheduled for December 2002/December 2003); and (3) before deciding to proceed with Privatization Phase II (scheduled for December 2005). In conducting these reviews, DOE will seek the advice of independent experts from the scientific and financial community, such as the National Academy of Sciences which will focus on the expected performance and the costs of waste treatment. DOE has established a TWRS Privatization Review Board consisting of Senior DOE representatives to provide on-going assistance and interactive oversight of the review of Part A deliverables and discussions with the contractors.

Informal evaluations also will be conducted as the information warrants. These formal and informal evaluations will help DOE to determine whether previous decisions need to be changed.

The Phased Implementation approach allows DOE to start remediating waste earlier than previously planned. With this approach, retrieval and processing of waste will begin on a small scale so that systems can be improved as knowledge is gained. This approach also permits DOE to continue research and development in critical areas, such as improved robotic retrieval systems, that may result in improved methods to reduce tank leaks during retrieval, and methods to remove residual waste that is difficult to retrieve.

The components of the demonstration phase (Phase I) will include: (1) continuing to safely manage the tank waste; (2) constructing and operating demonstration facilities; (3) collecting additional information through tank waste and vadose zone characterization; and (4) performing demonstrations of technologies that have the potential to reduce uncertainties associated with the TWRS program.

Continuing to safely manage the tank farms includes replacement of certain waste transfer piping and routine maintenance activities for tank farm instrumentation, ventilation, and electrical systems. Ongoing activities will include conducting environmental and safety related monitoring, removing pumpable liquids from the single-shell tanks, mitigating flammable gas safety hazards, and transferring currently stored waste and newly generated waste using the replacement cross-site transfer system, rail cars, and tanker trucks. DOE also plans to upgrade certain instrumentation, tank ventilation, and electrical system to upgrade the regulatory compliance status of the current facilities. The environmental impacts of these actions were not assessed in the TWRS EIS because the activities to be performed had not been sufficiently defined. DOE will evaluate the impacts of these actions in future NEPA analyses.

The demonstration phase, which will last approximately 10 years, includes the retrieval and treatment of a portion of the waste from the double-shell and single-shell tanks. The waste will be separated into low-activity waste and high-level waste through physical and chemical processes and then treated in demonstration-scale facilities. Vitrified high-level waste will be placed in interim storage at the Canister Storage Building pending future disposal at a national geologic repository. Immobilized low-activity waste will be prepared for future onsite disposal in existing grout vaults and similarly designed disposal facilities.

During the demonstration phase, DOE will conduct many activities to reduce the uncertainties associated with certain aspects of the project. For example, DOE will obtain extensive operational and cost data on a variety of issues by retrieving waste for treatment and constructing and operating the demonstration-scale facilities. DOE also will obtain more detailed information on the characteristics of the tank waste and potential impacts on groundwater by continuing to collect data through the existing tank waste and vadose zone characterization programs. Further, DOE will conduct a project known as the Hanford Tanks Initiative that will provide data on single-shell tank residual characteristics, single-shell tank retrieval technologies, tank residual removal technologies, and tank closure technologies. In addition, DOE will further investigate technologies that have the potential to reduce the uncertainties of the TWRS project, including evaluating alternative tank fill material for use during closure, demonstrating the effectiveness and efficiency of waste retrieval with sluicing technology, and evaluating a variety of other technologies through DOE's complex-wide technology ***8699** development programs. DOE also will prepare appropriate further NEPA documentation before making decisions on closure of the tank farms. This documentation will address the final disposition of the tanks, associated equipment, soils, and groundwater, and will integrate tank farm closure with tank waste remediation and other remedial action activities.

Phase II of the Phased Implementation alternative will begin after Phase I and will last approximately 30 years. Phase II will consist of continuing to safely manage the tank waste and constructing and operating full-scale facilities to treat the remainder of the tank waste. The tank waste will be retrieved and separated into low-activity waste and high-level waste. The low-activity waste will be immobilized and disposed of onsite in near-surface disposal facilities. The high-level waste will be vitrified, temporarily stored onsite, and transported offsite for disposal in a national geologic repository. DOE will use the lessons learned from the demonstration phase and the information obtained from further characterization and technology development activities to optimize operating efficiencies during Phase II and reduce construction and operating costs. DOE will continue to evaluate the path forward for the tank waste remediation program as additional data and technology development activities provide information relative to key technical and regulatory issues.

DOE currently plans to implement parts of this alternative through a privatization initiative whereby private companies will perform certain aspects of the remediation in an effort to use competition within the marketplace to bring new ideas and concepts to waste remediation and reduce project costs. The goal of privatization is to streamline the TWRS mission, transfer a share of the responsibility, accountability, and liability for successful performance to industry, improve performance, and reduce costs without sacrificing worker and public safety or environmental protection. On September 25, 1996, DOE issued contracts to two companies to initiate the design process for Phase I, Part A. Any of the contractors authorized to proceed to start Part B is anticipated to follow the same general approach described in the EIS for Phase I, Part B of the Phased Implementation alternative, including separating the waste into low-activity waste and high-level waste streams, vitrifying the high-level waste, and using high-temperature processes to immobilize low-activity waste. Both contractors' current plans include vitrifying low-activity waste upon approval to proceed with Phase I, Part B.

Before issuing these contracts DOE independently evaluated the environmental data and analyses submitted by the contractors and prepared a confidential environmental critique of the potential environmental impacts in accordance with DOE NEPA regulation 10 CFR 1021.216. After issuing the contracts, DOE prepared a publicly available environmental synopsis, based on the critique, to document the consideration given to environmental factors and to record that the relevant environmental consequences of reasonable alternatives have been evaluated in the selection process. This evaluation showed that the two proposals would have similar overall environmental impacts and that the impacts would be less than or approximately the same as the impacts described for Phase I of the Phased Implementation alternative. The environmental synopsis has been filed with the Environmental Protection Agency and is available at the DOE Public Reading Rooms and Information Repositories listed at the end of this Record of Decision. DOE will require the selected contractors to submit further environmental information and analysis and will use the additional information, as appropriate, to assist in the NEPA compliance process, including a determination under 10 CFR 1021.314 of the potential need for future NEPA analysis.

Basis for Selection

DOE has determined that through the many years of research and development throughout the DOE complex and specific studies on Hanford Site tank waste remediation, the technical uncertainties have been reduced to a manageable level. DOE has determined that the risks associated with proceeding with remediation are less than the risks of future releases of contaminants to the groundwater and of accidents in unremediated tanks that are deteriorating structurally. The cost of continuing to manage the unremediated tank waste facilities is high.

DOE has determined that it is necessary to retrieve the waste from the tanks to meet regulatory requirements, avoid future long-term releases to the groundwater that would threaten human health and the environment, and reduce health impacts to potential inadvertent intruders into the waste if administrative control of the Site were lost. An intermediate level of separating the waste into low-activity waste and high-level waste was selected because of the high disposal costs of alternatives with low levels of separation and the high degree of technical uncertainty associated with alternatives with extensive levels of separations. To address the remaining technical uncertainties that exist with the tank waste remediation program, the phased implementation approach was selected to provide the flexibility necessary to make midcourse adjustments to the remediation plans based on future characterization data, technology development, and technical and cost data developed during Phase I.

The Phased Implementation alternative provides for the permanent isolation of the waste from humans and the environment to the greatest extent practicable and protection of public health and the environment. A high percentage of the radionuclides will be disposed of offsite in a national geologic repository, which provides a high degree of permanent isolation of the most hazardous waste. Releases of contaminants to the groundwater at the Hanford Site will be reduced to the greatest extent practicable. The waste disposed of onsite will be isolated from humans and the environment by immobilizing the low-activity waste and placing it in near-surface disposal facilities covered with an earthen surface barrier.

The Phased Implementation alternative provides a balance among key factors that influenced the evaluation of the alternatives; short-term impacts to human health and the environment, long-term impacts to human health and the environment, managing the uncertainties associated with the waste characteristics and treatment technologies, costs, and compliance with regulatory requirements. It also provides a balance between the need to proceed with remediation and the potential advantages of delaying remediation to incorporate future technology developments. This alternative allows DOE to meet all regulatory requirements and reflects the values and concerns of many stakeholders.

Mitigation Measures

This decision adopts all practicable measures to avoid or minimize adverse environmental impacts that may result from the Phased Implementation alternative. These measures many of which are routine, include the following.

- All DOE nuclear facilities will be designed, constructed, and operated in compliance with the comprehensive set of DOE or commercial requirements that have been established to protect public health and the environment. These ***8700** requirements encompass a wide variety of areas, including radiation protection, facility design criteria, fire protection, emergency preparedness and response, and operational safety requirements;

- Measures will be taken to protect construction and operations personnel from occupational hazards and minimize occupational exposures to radioactive and chemical hazards;

- Emergency response plans will be developed to allow rapid response to potentially dangerous unplanned events;

- Water and other surface sprays will be used to control dust emissions, especially at borrow sites, gravel or dirt haul roads, and during construction earthwork;

- Areas for new facilities will be selected to minimize environmental impacts to the extent practicable;

- Pollution control or treatment will be used to reduce or eliminate releases of contaminants to the environment and meet regulatory standards;

- Extensive environmental monitoring systems will be implemented to continually monitor potential releases to the environment;

- All newly disturbed areas will be recontoured to conform with the surrounding terrain and revegetated with locally derived native plant species consistent with Sitewide biological mitigation plans;

- Historic, prehistoric, and cultural resource surveys will be performed for any undisturbed areas to be impacted;

- Potential impacts to shrub-steppe habitat and cultural resources will be among the factors considered in a NEPA analysis to support the site selection process for facilities and earthen borrow sites; and

- Consultation with Tribal Nations and government agencies will be performed throughout the planning process to address potential impacts to shrub-steppe habitat, religious sites, natural resources, and medicinal plants.

Mitigation measures will be refined and presented in the Tank Waste Remediation Mitigation Action Plan. Tribal Nations and agencies will be consulted, as appropriate, during preparation of the Mitigation Action Plan.

Cesium and Strontium Capsules

DOE has decided to defer the decision on the disposition of the cesium and strontium capsules for up to two years. In effect, DOE will implement the No Action alternative until a final disposition decision is made and implemented. The encapsulated cesium and strontium have potential value as commercial and medical irradiation or heat sources, and implementing disposal alternatives would foreclose options for these applications. DOE is evaluating the potential for commercial and medical uses. In addition, DOE is considering mixing the cesium with surplus plutonium; the cesium would serve as a radiation barrier and be immobilized with the plutonium. Mixing the cesium with the plutonium would enhance nuclear materials security by making future use of the plutonium by unauthorized persons very hazardous and difficult. DOE will reevaluate the decision on the disposition of the capsules after determinations are made on the potential for future use of cesium and strontium. DOE is preparing a Cesium and Strontium Management Plan that will address alternatives for beneficial uses of the capsules prior to final disposition. If DOE decides not to use the cesium and strontium for any of these purposes, one of the alternatives for permanent disposal of the capsules will be selected and DOE will supplement this Record of Decision. Before making such a decision, DOE intends to further study disposal alternatives to resolve uncertainties and better understand long-term impacts, as recommended by the National Research Council (see Appendix).

Comments on the Draft EIS and Agency Responses

DOE and Ecology received comments on the Draft EIS from 102 individuals, organizations, agencies, or Tribal Nations including the Washington State Department of Wildlife, Oregon State Department of Energy, Nez Perce Tribe, Yakama Indian Nation, and the Confederated Tribes of the Umatilla Indian Reservation. All comments received were addressed in the Final EIS, Volume Six, Appendix L, and revisions to the Final EIS were made, as appropriate, to address applicable comments. A complete copy of all comments received on the Draft EIS is available in each of the DOE Public Reading Rooms and Information Repositories at the locations listed at the end of this Record of Decision.

Comments Received After Publication of the Final EIS and DOE Responses

DOE received comments from the Washington State Department of Fish and Wildlife on the Final EIS and comments from the National Research Council on the Draft EIS after publication of the Final EIS. A summary of these comments and DOE's responses is attached as an appendix to this Record of Decision. These comments were considered in the preparation of this Record of Decision.

DOE Public Reading Rooms and Information Repositories

- University of Washington, Suzzallo Library, Government Publications Room, Seattle, WA 98185. (206) 685-9855, Monday-Thursday, 9 a.m. to 8 p.m.; Friday and Saturday, 9 a.m. to 5 p.m.

- Gonzaga University, Foley Center, E. 502 Boone, Spokane, WA 99258. (509) 328-4220 ext. 3829, Monday-Thursday, 8 a.m. to midnight, Friday, 8 a.m. to 9 p.m.; Saturday, 9 a.m. to 9 p.m.; Sunday, 11 a.m. to midnight.

- U.S. Department of Energy Reading Room, Washington State University, Tri-Cities Campus, 100 Sprout Road, Room 130W, Richland, WA 99352, (509) 376-8583, Monday-Friday, 10 a.m. to 4 p.m.

- Portland State University, Bradford Price Millar Library, Science and Engineering Floor, SW Harrison and Park, Portland, OR 97207, (503) 725-3690, Monday-Friday, 8 a.m. to 10 p.m.; Saturday, 10 a.m. to 10 p.m.; Sunday, 11 a.m. to 10 p.m.

- U.S. Department of Energy, Headquarters, Freedom of Information Public Reading Room, 1E-190 Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585, (202) 586-6020, Monday-Friday, 9 a.m. to 4 p.m.

A copy of the Record of Decision is also available via the Internet at www.hanford.gov/eis/twrseis.htm and http://tis-nt.eh.doe.gov/nepa.

Issued in Washington, DC, this day, February 20, 1997.

Alvin Alm,

Assistant Secretary for Environmental Management.

Appendix—Comments Received After Publication of the Final EIS

The U.S. Department of Energy (DOE) received comments and recommendations from the National Research Council and the Washington State Department of Fish and Wildlife after publication of the Final Environmental Impact Statement (EIS). The following is a summary of these comments and DOE's responses.

National Research Council Comments

On March 4, 1996, DOE requested that the National Research Council (Council), Committee on Remediation of Buried and Tank Waste, review the Tank Waste Remediation System (TWRS) Draft EIS. DOE received the Council's comments and recommendations regarding the Draft EIS on September 6, 1996 (after the Final EIS had been published) in a report entitled "The Hanford Tanks: ***8701** Environmental Impacts and Policy Choices". Although this report was issued too late to be considered in the Final EIS, DOE did consider the Council's comments in the preparation of this Record of Decision.

DOE generally agrees with the comments and recommendations made by the Council. Because several other commentors on the Draft EIS identified similar concerns, many of the Council's comments and recommendations were incorporated in the Final EIS prior to receipt of the Council's report. DOE believes the Record of Decision reflects stakeholder values regarding the need for action, provides a balance among short- and long-term environmental impacts, meets regulatory requirements and agreements, and addresses technical uncertainties, while also accommodating, to the extent possible, the underlying concern of the Council regarding the need for phased decision making.

The following is a summary of the National Research Council's comments and DOE's responses.

Comment 1: Uncertainties, both stated and unstated, concerning the Hanford wastes, the environment, and the remediation processes are found throughout the DEIS. Significant uncertainties exist in the areas of technology, costs, performance, regulatory environment, future land use, and health and environmental risks. Among the issues that remain uncertain are:

- Effectiveness in practice of technologies to remove and treat waste from tanks,

- Costs of operations and offsite waste disposal,

- Future policy and regulatory environment,

- Characterization of tank wastes,

- Relation between tank waste removal, remediation of the surrounding environment, and ultimate land use at the site, and

- Long-term risks associated with various alternatives for treating and processing the tank wastes, both in relation to residues left on site and risks transferred offsite when processed wastes are moved to a national geologic repository.

The preferred Phased Implementation alternative presented in the DEIS does not adequately address all of the uncertainties that make it difficult to decide how to complete remediation of the tanks. During Phase I, cesium and technetium, the most troublesome elements in a vitrifier, are to be removed from the high-level waste that is sent to the pilot vitrification plant, potentially limiting the value of information obtained from the pilot plant operations. This may also delay a decision on the final waste form for these elements.

Plans for building a pilot plant should proceed, but in the context of a phased decision strategy that does not preclude processing of wastes other than the double-shell tank supernatant or producing waste forms other than the glass currently planned.

Response 1: DOE agrees with the Council that there are substantial uncertainties associated with the tank waste remediation program. In response to similar comments, DOE revised the EIS to enhance the discussion of uncertainties, including the relevance of the uncertainties in the evaluation of alternatives. The Final EIS provides an extensive discussion on uncertainties in Appendix K, which includes DOE's detailed evaluation of the uncertainties and impacts associated with the tank waste remediation program alternatives. In light of the uncertainties related to the remediation of tank waste, DOE has committed to reevaluate the program as DOE continues to learn from these activities to ensure that DOE will stay on a correct course for managing the tank wastes.

The Council placed particular emphasis on recommending the use of a “phased decision strategy” because of the technical uncertainties in tank waste management. DOE has decided to implement the Phased Implementation alternative, which DOE believes will achieve many of the goals of the phased decision strategy recommended by the Council. DOE believes that the many years of technology evaluations throughout the DOE Complex have reduced the uncertainties to a manageable level, and the risks of proceeding with remediation are less than the risks of further releases of contaminants from the tanks and the potential for accidents in unremediated tanks. In addition, the cost of continuing to manage the tank waste in facilities that have exceeded their design life are high. DOE believes the Phased Implementation alternative provides adequate flexibility to accommodate changes in the tank waste remediation program as additional information is developed. Responses to the Council's other comments, below, provide additional detail on how DOE intends to reduce the technical uncertainties while proceeding with the Phased Implementation alternative.

Phase I of the Phased Implementation alternative includes both low-activity and high-level waste treatment and immobilization. Any radionuclides separated from the low-activity waste feed stream, including cesium and technetium, will be vitrified in the high-level waste facility. This will provide important information on the performance of the separations process and of vitrification of troublesome elements like cesium and technetium.

By performing Phase I of the Phased Implementation alternative and proceeding with other technology development projects and tank waste characterization, the uncertainties associated with the tank waste program will be reduced further. Initiatives that DOE is pursuing to reduce uncertainties in support of the TWRS program include:

- The Hanford Tanks Initiative, which will provide data on characterization of tank residuals, technologies for waste retrieval, technologies for removing tank residuals, and criteria for closing tanks;

- Completion of the tank waste characterization program, which will provide data relative to tank waste safety issues and the contents of the tanks;

- Determination of the level of contamination in the vadose zone;

- Development of a comprehensive plan to integrate tank waste remediation with tank farm closure and other remediation activities related with the TWRS program;

- Integration of TWRS program implementation with the plans for developing a national geologic repository for high-level waste;

- Demonstrations of the efficiency and effectiveness of retrieval sluicing technology to support the tank waste remediation activities; and

- Demonstrations of various tank waste separations and treatment processes.

Comment 2: The DEIS surveyed a wide range of remediation options, including strategies in which tanks with varying contents are treated differently. However, the committee believes that additional alternatives for management of the tank wastes need to be explored in parallel, using a phased decision strategy like the one outlined in this report. Such a strategy would provide flexibility in the event that specific, preferred technologies or management approaches do not perform as anticipated or that innovative waste management and remediation technologies emerge. Among additional options that should be analyzed are (1) in-tank waste stabilization methods that are intermediate between in situ vitrification and filling of the tanks with gravel, (2) subsurface barriers that could contain leakage from tanks, and (3) selective partial removal of wastes from tanks, with subsequent stabilization of ***8702** residues, using the same range of treatment technologies as in the alternatives involving complete removal of wastes.

When funding is constrained, it is more difficult to devote resources to the continued development of backup options. However, considering the uncertainty in the cost and performances of the technologies required for the preferred alternative, a time period during which funding is constrained is precisely the wrong time to drop work on alternatives that might achieve satisfactory results at a significantly lower cost. Having such alternatives available could allow remediation to proceed expeditiously, even if funding constraints prevent timely implementation of the currently preferred alternative.

Response 2: As discussed in the response to comment 1, DOE agrees that significant uncertainties exist in the tank waste remediation program and that the strategy selected needs to be flexible to respond to new information and the results of research and development efforts. Additional alternatives and refinements of alternatives need to be developed and evaluated.

The Council's report recommends a “phased decision strategy,” while DOE's preferred alternative is the “Phased

Implementation alternative." There are important similarities and differences between these two approaches. Under the Council's phased decision strategy, the first phase would identify and develop alternative approaches to remediate the tank waste. Decisions on alternatives for subsequent phases would be deferred until information from the first phase is evaluated. This approach has the advantage of not prematurely foreclosing options enabling DOE to further study and develop technologies and that might reduce cost and/or risk. It has the disadvantage of leaving the total cost, schedule, and final outcome highly uncertain. Under DOE's Phased Implementation alternative, the complete path forward for tank waste remediation has been determined, while recognizing that the path can be modified as new information becomes available. However, DOE has committed to conduct formal and informal reviews with the intent to mitigate the concern of making long-term decisions in the near-term.

The DOE Phased Implementation decision addresses current regulatory requirements and cleanup commitments while maintaining the flexibility necessary to modify the TWRS program if emerging information (e.g., new characterization data, technology breakthroughs, etc.) indicates there is a need to change the direction of the program. At the same time, technology development activities, such as the Hanford Tanks Initiative, will continue, in order to provide alternative paths if preferred technologies do not perform as anticipated. In addition to current programs, the Conference Report for the Energy and Water Development Appropriations Act, 1997 recommends up to $15 million in technology development activities to support the tank waste program.

Other activities, which are critical to the overall TWRS program, will be conducted by DOE throughout Phase I. These activities include single-shell tank waste retrieval, developing methods for quantifying and characterizing the waste residuals left in the tanks following retrieval, and studying the leakage rate of tank wastes during the retrieval process. Contractors will have access to technologies being developed by other DOE programs and will be able to use these technologies if appropriate.

The Final EIS evaluated possible alternatives for remediating the tank waste. There are, as the Council noted, a great number of variations or combinations of alternatives; DOE could not evaluate all such combinations in the EIS. Rather, DOE evaluated a complete range of reasonable tank waste management options, and thereby obtained adequate information for the strategic choice of direction made in this ROD. The use of alternate fill material for tank closure was not evaluated directly, but such alternatives are qualitatively within the range of alternatives analyzed in detail, and DOE was adequately informed about them for the purposes of this EIS. These alternatives will be addressed more directly in future NEPA analysis on tank closure. In this EIS, DOE considered the use of subsurface barriers as a potential mitigation measure during tank waste retrieval. Subsurface barriers were also evaluated in a Feasibility Study completed in 1995. Additional development work is being performed by DOE, and if promising new developments occur, DOE will reconsider the application of subsurface barriers for the tanks. Two alternatives for partial retrieval of the wastes that were similar to the selective partial retrieval alternative that the Council recommended be analyzed were included in the alternatives analyzed. DOE will continue to reevaluate these and other alternatives as more information becomes available.

In situ disposal of single-shell tank wastes and in-tank stabilization of tanks with residuals (not removed by retrieval) have been the subject of previous studies and were evaluated as part of the Systems Engineering Study for the Closure of Single-Shell Tanks. Alternatives for closing tanks with residual waste were evaluated in the Engineering Study of Tank Fill Alternatives for Closure of Single-Shell Tanks released in September 1996. Additional studies supporting stabilization of tanks with residual waste remaining following completion of retrieval operations are planned during Fiscal Year 1997 and Fiscal Year 1998 as part of the Hanford Tanks Initiative.

In addition to the two ex situ/in situ tank waste disposal alternatives that were evaluated in the TWRS EIS, selective partial removal of wastes from tanks, using a risk-based approach, was evaluated in the study entitled "Remediation and Cleanout Levels for Hanford Site Single-Shell Tanks" (Westinghouse Hanford Company, 1995, WHC-SD-WM-TI-711).

This Record of Decision adopts a long-term strategy that will focus efforts on achieving the ultimate TWRS remediation goals while continuing to characterize tank wastes, evaluate new technologies and improve risk assessments. DOE believes that its past studies have reduced the uncertainties enough to enable DOE to make a decision on a long-term tank waste remediation strategy. Although this approach differs from the phased decision strategy recommended by the Council, DOE intends to implement its decision in a manner that is flexible enough to accommodate appropriate mid-course corrections in the tank waste remediation strategy, based on lessons learned in the pilot studies or from other new information.

Comment 3: The scope of the DEIS also has significant limitations. Because the DEIS does not address remediation of the tanks themselves and associated environmental contamination, the alternatives it considers for tank waste remediation are not defined well enough. In addition, the connections between tank remediation alternatives and other cleanup activities at the Hanford Site are not taken into account. Because tank waste remediation alternatives are analyzed and evaluated in isolation from other geographically-related contamination at the Hanford Site, information about risks and costs in the DEIS is difficult to place in a proper perspective.

Response 3: DOE agrees with the Council's observation that there is a ***8703** need to integrate remediation of the tank waste with future tank closure decisions and other geographically related remedial actions at the Hanford Site. The Final EIS addresses tank farm closure and other geographically related contamination and remediation activities to the extent possible with current information and to the extent necessary for DOE to make decisions concerning tank waste remediation. The EIS presents (1) information relative to closure to provide the public and decision makers with information on how decisions made now may affect future decisions on closure; (2) information on which alternatives would preclude the future selection of clean closure for the tank farms; and (3) information on cumulative impacts, including the effects of other site activities. This information provides a context for understanding the strategic decisions, now ripe, that are the focus of this EIS. To support the analysis, DOE used closure of a landfill as a representative closure scenario for each alternative, thus providing for a meaningful comparison of the alternatives. DOE intends to prepare a comprehensive plan to integrate tank waste remediation with tank farm closure activities and other Hanford Site remediation programs.

Comment 4: Decisions regarding tank remediation must consider risk, cost, and technical feasibility. Where risks are involved, care should be taken to present a range of potential risks, including expected or most likely estimates as well as the upper-bound estimates presented in the DEIS. While upper-bound estimates may give confidence that actual impacts will not exceed those presented in the DEIS from a worst-case perspective, the inherent uncertainties in risk assessments can distort the comparison of alternatives. This is of particular concern when the upper-bound estimates are derived from a cascade of parameters, much of which was also derived on an upper-bound basis.

While the committee recognizes the utility of quantitative risk assessment in the comparison of remedial alternatives, the limitations of analysis must be underscored. Given the complexity of the Hanford tank farms, many of the potential uncertainties cannot be measured, quantified, or expressed through statistically derived estimates. According to the 1996 National Research Council report Understanding Risk, the 1996 U.S. Environmental Protection Agency report Proposed Guidelines for Carcinogen Risk Assessment, and a recent draft report by the

Commission on Risk Assessment and Risk Management, characterization of risk should be both qualitative and quantitative. In this case, qualitative information should include a range of informed views on the risks and the evidence that supports them, the risk likelihood, and the magnitude of uncertainty. Such evaluations of risk should be based on deliberative scientific processes that clarify the concerns of interested and affected parties to prevent avoidable errors, provide a balanced understanding of the state of knowledge, and ensure broad participation in the decision-making process.

Response 4: DOE agrees with these comments and has modified the EIS accordingly in response to similar comments on the Draft EIS received during the public comment period. For example, DOE believes that characterization of the risk should be quantitative when possible and qualitative when parameters are uncertain by more than an order of magnitude. The Final EIS presents the “expected”, or “nominal” ranges of risk and upper-bound estimates, and includes (in Appendix E) detailed analysis of uncertainties.

Comment 5: It should be expected that the environmental regulations governing the tank wastes, and the Hanford Site in general, will change over the time during which waste management and environmental remediation occur. DOE should work with the appropriate entities to ensure that future regulatory changes and the future selection of tank remediation approaches are on convergent paths. The development, testing, and analysis of alternatives during the first phase should continue unconstrained by current regulatory requirements and should examine currently untested technologies.

Response 5: DOE agrees that ongoing dialogue with the regulators is necessary to making sound tank waste management decisions. DOE continues to work with the Federal and State regulatory authorities and with the stakeholders to share evolving information regarding impacts and technologies. Toward that end, DOE developed the reasonable alternatives to be analyzed in the EIS on a scientific and engineering basis, then evaluated the alternatives for compliance with regulations. Only four of the ten alternatives addressed in the EIS could be implemented consistent with existing Federal and State regulations. The Record of Decision, however, selects a compliant approach.

Comment 6: Concerning the management and disposal of the cesium and strontium capsules and of the miscellaneous underground storage tanks, the committee found that the DEIS lacks enough substantive information for an evaluation of the proposed remediation strategies. Over 99 percent of the tank wastes is in the single-shell and double-shell tanks, and that is where the greatest potential for health and environmental risk exists. However, the extremely high concentration of radioactivity and the nature of the materials in the capsules necessitate a more thorough discussion of their treatment, disposal, and environmental impact. There are serious deficiencies in the attention given to the long-term changes in the chemical and isotopic composition of the cesium and strontium capsules. The large number and wide distribution of the miscellaneous underground storage tanks make a more complete discussion of their management necessary.

Response 6: DOE agrees with the Council that there is not enough substantive information regarding the cesium and strontium capsules to make a long-term decision on their final disposition. DOE also wants to evaluate potential beneficial uses of the capsules and has decided to defer any disposition of the capsules. In the meanwhile, a Cesium and Strontium Management Plan is currently being prepared by DOE that will address alternatives for beneficial uses of the capsules prior to final disposition. As part of the plan, DOE will continue to collect and analyze information regarding the capsules to reduce uncertainties and better understand long-term impacts, and to ensure that the long-term decision is appropriate.

With regard to the miscellaneous underground storage tanks, DOE believes, based on currently available information, that the waste contained in the miscellaneous underground storage tanks is similar to the waste contained in the single-shell tanks. Because the miscellaneous underground storage tanks represent a small percentage (0.5 percent) of the overall waste volume, the potential long-term impacts posed by the miscellaneous underground storage tanks are within the range of impacts calculated for the single-shell tanks and double-shell tanks. The short-term and long-term impacts associated with the miscellaneous underground storage tanks for activities such as waste retrieval and transfer were analyzed in the EIS.

Comment 7: The proper approach to decision making for tank farm cleanup is to use a phased decision strategy in which some cleanup activities would proceed in the first phase while ***8704** important information gaps are filled concurrently to define identified remediation alternatives more clearly, and possibly to identify new and better ones. As part of this strategy, periodic independent scientific and technical expert reviews should be conducted so that deficiencies may be recognized and midcourse corrections be made in the operational program.

Response 7: DOE agrees with the Council that periodic independent scientific and technical expert reviews are essential to the success of the TWRS program. While carrying out the current decisions, DOE will continually evaluate new information relative to the tank waste remediation program. DOE also intends to conduct formal evaluations of new information relative to the tank waste remediation program at three key points over the next eight years under its NEPA regulations (10 CFR 1021.314), with an appropriate level of public involvement, to ensure that DOE will stay on a correct course for managing and remediating the waste. As remediation proceeds in the coming years, DOE will learn more about management and remediation of the tank waste and ways to protect public and worker health and the environment. Within this time frame, DOE will obtain additional information on the effectiveness of retrieval technologies, characteristics of the tank wastes, effectiveness of waste separation and immobilization techniques, and more definitive data on the costs of retrieval, separations, and immobilization of the waste. These formal reevaluations will incorporate the latest information on these topics. DOE will conduct these formal evaluations of the entire TWRS program at the following stages: (1) before proceeding into Privatization Phase I Part B (scheduled for May 1998); (2) prior to the start of hot operations of Privatization Phase I Part B (scheduled for December 2002/December 2003); and (3) before deciding to proceed with Privatization Phase II (scheduled for December 2005). In conducting these reviews, DOE will seek the advice of independent experts from the scientific and financial community, such as the National Academy of Sciences which will focus on performance criteria and the costs of waste treatment. DOE has established a TWRS Privatization Review Board consisting of Senior DOE representatives to provide on-going assistance and interactive oversight of the review of Part A deliverables and discussions with the contractors.

Informal evaluations also will be conducted as the information warrants. These formal and informal evaluations will help DOE to determine whether previous decisions need to be changed.

Washington State Department of Fish and Wildlife Comment

Comment: The Washington State Department of Fish and Wildlife recommends that the following language be included in the Record of Decision:

"The site selection of the precise location of remediation facilities for the selected alternative shall be subject to future supplemental NEPA analysis. This supplemental NEPA analysis shall commit to a supplemental Mitigation Action Plan. The Mitigation Action Plan and supplemental Mitigation Action Plan will be prepared in consultation with the Washington State Department of Fish and Wildlife and the U.S. Fish and Wildlife Service, with input from the Hanford Site's Natural Resource Trustee Council."

"Impacts to State priority shrub-steppe habitat would be one of the evaluation criteria used in site selection. The site selection process would include the following hierarchy of measures:

- Avoid priority shrub-steppe habitat to the extent feasible by locating or configuring project elements in pre-existing disturbed areas.

- Minimize project impacts to the extent feasible by modifying facility layouts and/or altering construction timing."

"Compensatory mitigation measures for the loss of shrub-steppe habitat shall be identified and implemented in the supplemental NEPA analysis and Mitigation Action Plan."

Response: DOE believes that the following approach satisfies the substance of these comments.

The EIS (Section 5.20) describes both mitigation measures that are integral parts of all of the alternatives (Section 5.20.1) and further mitigation measures that could be implemented when indicated or appropriate (Section 5.20.2). In selecting the preferred alternative DOE has committed to all of the mitigation measures in Section 5.20.1, which include measures to restore newly disturbed areas. As the State requested, the Record of Decision commits to conducting NEPA analysis for site selection of facilities.

DOE intends to implement those further measures described in Section 5.20.2 as may be necessary to mitigate potential impacts on priority shrub-steppe habitat, and will consider the potential for such impacts as a factor in the site selection process for TWRS facilities. The site selection process will include the following hierarchy of measures: (1) avoid undisturbed shrub-steppe areas to the extent feasible; (2) minimize impacts to the extent feasible; (3) restore temporarily disturbed areas; (4) compensate for unavoidable impacts by replacing habitat; and (5) manage critical habitat on a Sitewide basis.

DOE believes that mitigation of impacts to habitats of special importance to the ecological health of the region is most effective when planned and implemented on a sitewide basis. Recognizing this, DOE is preparing a sitewide biological management plan to protect these resources. Under this sitewide approach, the potential impacts of all projects would be evaluated and appropriate mitigation would be developed based on the cumulative impacts to the ecosystem. Mitigation to reduce the ecological impacts from TWRS remediation would be performed in compliance with the sitewide biological management plan. Mitigation would focus on disturbance of contiguous, mature sagebrush-dominated shrub-steppe habitat. Compensation (habitat replacement) would occur where DOE deems appropriate. Specific mitigation ratios, sites, and planting strategies (e.g., plant size, number, and density) for TWRS facilities and operations would be defined in the TWRS Mitigation Action Plan, which would be revised for each specific TWRS facility siting decision. The Mitigation Action Plan would be prepared in consultation with the Washington State Department of Fish and Wildlife, the U.S. Fish and Wildlife Service, and Tribal Nations, with input from the Hanford Site's Natural Resources Trustees Council. DOE will make the Mitigation Action Plan publicly available before taking action that is the subject of a mitigation commitment.

[FR Doc. 97-4696 Filed 2-25-97; 8:45 am]

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62 FR 8693-02, 1997 WL 77915 (F.R.)

Attachment 2

Yucca Mountain Final EIS Excerpts
February 2002

Final

Environmental Impact Statement

for a
Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada

Volume II
Appendixes A through O

U.S. Department of Energy
Office of Civilian Radioactive Waste Management

DOE/EIS-0250

February 2002

Appendix A

Inventory and Characteristics of Spent Nuclear Fuel, High-Level Radioactive Waste, and Other Materials

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APPENDIX A. INVENTORY AND CHARACTERISTICS OF SPENT NUCLEAR FUEL, HIGH-LEVEL RADIOACTIVE WASTE, AND OTHER MATERIALS

A.1 Introduction

This appendix describes the inventory and characteristics of the spent nuclear fuel and high-level radioactive waste that the U.S. Department of Energy (DOE) anticipates it would place in a monitored geologic repository at Yucca Mountain. It includes information about other highly radioactive material that DOE could dispose of in the proposed repository. It also provides information on the background and sources of the material, present storage conditions, the final disposal forms, and the amounts and characteristics of the material. The data provided in this appendix are the best available estimates of projected inventories.

The Proposed Action inventory evaluated in this environmental impact statement (EIS) consists of 70,000 metric tons of heavy metal (MTHM), comprised of 63,000 MTHM of commercial spent nuclear fuel and 7,000 MTHM of DOE materials. The DOE materials consist of 2,333 MTHM of spent nuclear fuel and 4,667 MTHM (8,315 canisters) of solidified high-level radioactive waste. The inventory includes surplus weapons-usable plutonium, which would be in the forms of spent mixed-oxide fuel and immobilized plutonium.

The Nuclear Waste Policy Act, as amended (also called the NWPA), prohibits the U.S. Nuclear Regulatory Commission from approving the emplacement of more than 70,000 MTHM in the first repository until a second repository is in operation [Section 114(d)]. However, in addition to the Proposed Action, this EIS evaluates the cumulative impacts for two additional inventories (referred to as Inventory Modules 1 and 2):

- The Module 1 inventory consists of the Proposed Action inventory plus the remainder of the total projected inventory of commercial spent nuclear fuel (for maximum projections, see Section A.2.1.5.1), high-level radioactive waste, and DOE spent nuclear fuel. Emplacement of Inventory Module 1 wastes in the repository would raise the total amount emplaced above 70,000 MTHM. As mentioned above, emplacement of more than 70,000 MTHM of spent nuclear fuel and high-level radioactive waste would require legislative action by Congress unless a second licensed repository was in operation.

- Inventory Module 2 includes the Module 1 inventory plus the inventories of the candidate materials, commercial Greater-Than-Class-C low-level radioactive waste and DOE Special-Performance-Assessment-Required waste. There are several reasons to evaluate the potential for disposing of these candidate materials in a monitored geologic repository in the near future. Because both materials exceed Class C low-level radioactive limits for specific radionuclide concentrations as defined in 10 CFR Part 61, they are generally unsuitable for near-surface disposal. Also, the Nuclear Regulatory Commission specifies in 10 CFR 61.55(a)(2)(iv) the disposal of Greater-Than-Class-C waste in a repository unless the Commission approved disposal elsewhere. Further, during the scoping process for this EIS, several commenters requested that DOE evaluate the disposal of other radioactive waste types that might require isolation in a repository. Disposal of Greater-Than-Class-C and Special-Performance-Assessment-Required wastes at the proposed Yucca Mountain Repository could require a determination by the Nuclear Regulatory Commission that these wastes require permanent isolation. The present 70,000-MTHM limit on waste at the Yucca Mountain Repository could have to be addressed either by legislation or by opening a second licensed repository.

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A.1.1.3 Final Waste Form

Other than drying or potential repackaging, treating is not necessary for commercial spent nuclear fuel. Therefore, the final form would be spent nuclear fuel either as bare intact assemblies or in sealed canisters. Bare intact fuel assemblies are those with structural and cladding integrity such that they can be handled and shipped to the repository in an approved shipping container for repackaging in a waste package in the Waste Handling Building. Other assemblies would be shipped to the repository in canisters that were either intended or not intended for disposal. Canisters not intended for disposal would be opened and their contents repackaged in waste packages in the Waste Handling Building.

For most of the DOE spent nuclear fuel categories, the fuel would be shipped in disposable canisters (canisters that can be shipped and are suitable for direct insertion into waste packages without being opened) in casks licensed by the Nuclear Regulatory Commission. Uranium oxide fuels with intact zirconium alloy cladding are similar to commercial spent nuclear fuel and could be shipped either in DOE standard canisters or as bare intact assemblies. Uranium metal fuels from Hanford and aluminum-based fuels from the Savannah River Site could require additional treatment or conditioning before shipment to the repository. If treatment was required, these fuels would be packaged in DOE disposable canisters. Category 14 sodium-bonded fuels are also expected to require treatment before disposal.

High-level radioactive waste shipped to the repository would be in stainless-steel canisters. The waste would have undergone a solidification process that yielded a leach-resistant material, typically a glass form called borosilicate glass. In this process, the high-level radioactive waste is mixed with glass-forming materials, heated and converted to a durable glass waste form, and poured into stainless-steel canisters (DIRS 104406-Picha 1997, Attachment 4, p. 2). Ceramic and metal waste matrices would be sent to the repository from Argonne National Laboratory-West in Idaho. The ceramic and metal matrices would be different solidified mixtures that also would be in stainless-steel canisters. These wastes would be the result of the electrometallurgical treatment of sodium bonded fuels.

As briefly described in Section A.1.1.1, the surplus weapon-usable plutonium could be sent to the repository in two different waste forms—spent mixed-oxide fuel assemblies or an immobilized plutonium ceramic form in a high-level radioactive waste canister and surrounded by high-level radioactive waste. The spent mixed-oxide fuel assemblies would be very similar to conventional low-enriched uranium assemblies and DOE would treat them as such. The immobilized plutonium would be placed in small cans, inserted in the high-level radioactive waste canisters, and covered with molten borosilicate glass (can-in-canister technique). The canisters containing immobilized plutonium and high-level radioactive waste would be externally identical to the normal high-level radioactive waste canisters.

A.1.1.4 Waste Characteristics

A.1.1.4.1 *Mass and Volume*

As discussed in Section A.1, the Proposed Action includes 70,000 MTHM in the forms of commercial spent nuclear fuel, DOE spent nuclear fuel, high-level radioactive waste, and surplus weapons-usable plutonium. Figure A-2 shows percentages of MTHM included in the Proposed Action and the relative amounts of the totals of the individual waste types included in the Proposed Action. As stated above, the remaining portion of the wastes is included in Inventory Module 1. Because Greater-Than-Class-C and Special-Performance-Assessment-Required wastes are measured in terms of volume, Figure A-3 shows the relative volume of the wastes in Inventory Module 2 compared to the inventory in Module 1.

The No-Action Alternative (see Chapter 7 and Appendix K) used this information to estimate the mass and volume of the spent nuclear fuel and high-level radioactive waste at commercial and DOE sites in five regions of the contiguous United States.

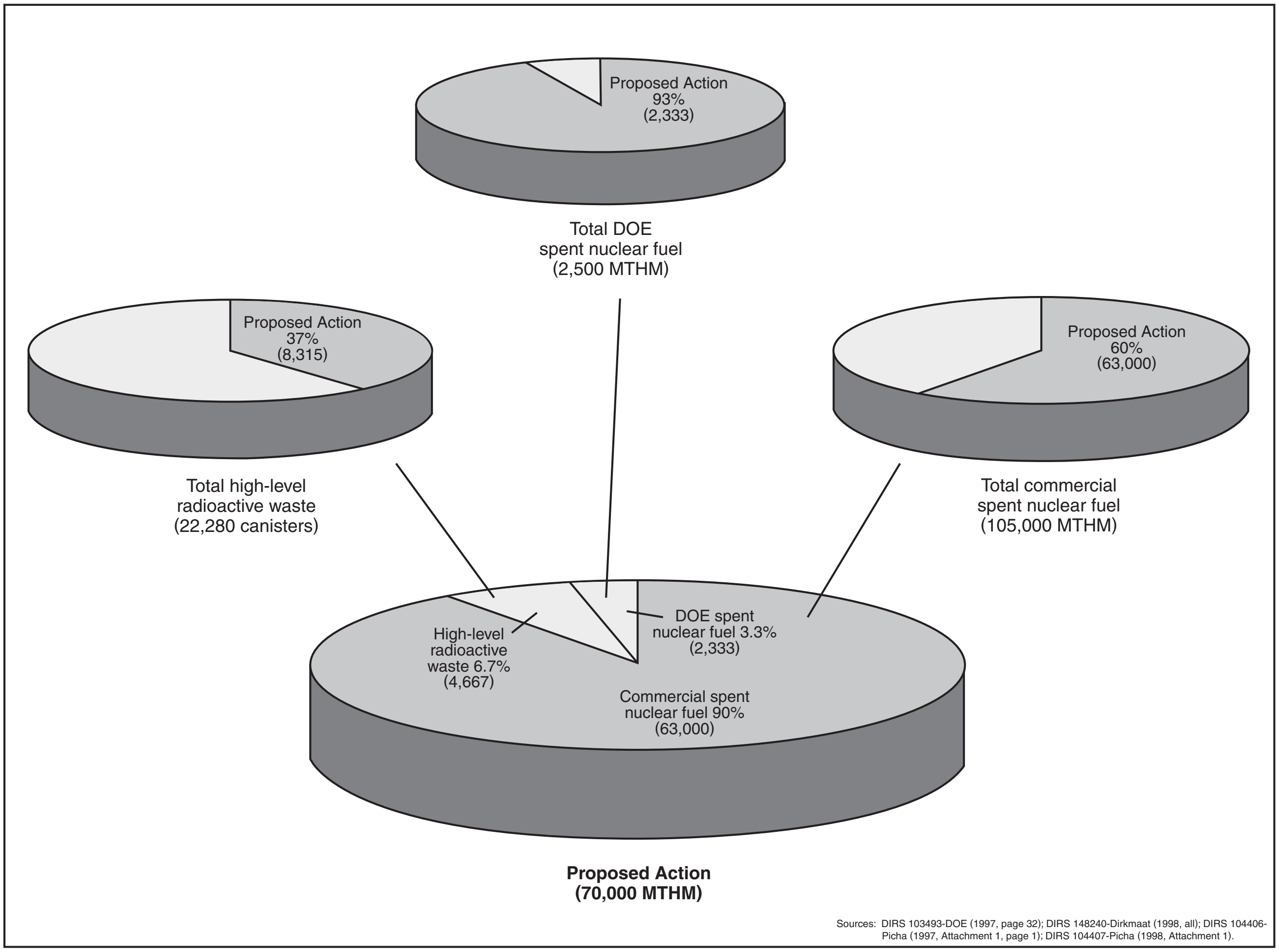

Figure A-2. Proposed Action spent nuclear fuel and high-level radioactive waste inventory.

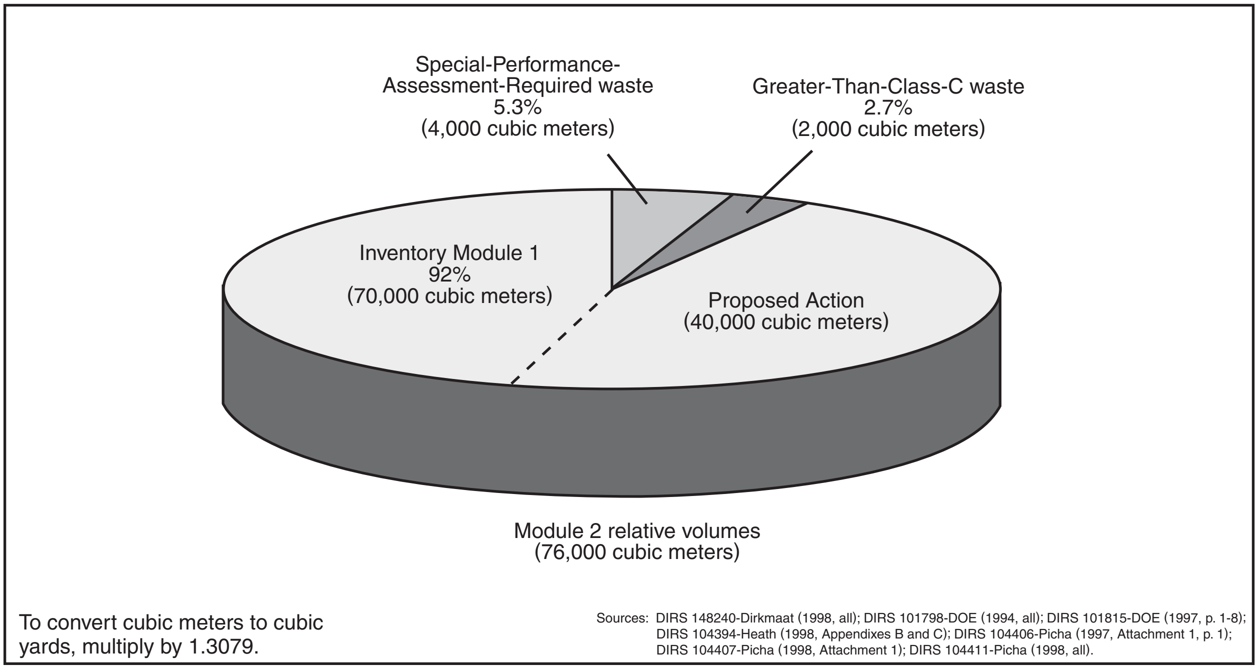

Figure A-3. Inventory Module 2 volume.

The mass and volume data for commercial spent nuclear fuel are based on annual tracking of current inventories and projections of future generations. Because increases in spent nuclear fuel inventories due to plant life extensions have been factored into the Module 1 and 2 inventories, DOE anticipates few changes in the overall mass and volume projections for this waste type. The data projections for DOE spent nuclear fuel are fairly stable because most of the projected inventory already exists, as opposed to having a large amount projected for future generation. Mass and volume data for high-level radioactive waste estimates are not as reliable. Most high-level radioactive waste currently exists as a form other than solidified borosilicate glass. The solidification processes at the Savannah River Site and West Valley Demonstration Project began in the mid-1990s; therefore, their resulting masses and volumes are known. However, the processes at the Idaho National Engineering and Environmental Laboratory and the Hanford Site have not started. Therefore, there is some uncertainty about the mass and volume that would result from those processing operations. For this analysis, DOE assumed that the high-level radioactive waste from the Hanford Site and the Idaho National Engineering and Environmental Laboratory would represent approximately 63 and 6 percent of the total high-level radioactive waste inventory, respectively, in terms of the number of canisters.

A.1.1.4.2 *Radionuclide Inventories*

The primary purpose of presenting these data is to quantify the radionuclide inventory expected in the projected waste types. These data were used for accident scenario analyses associated with transportation, handling, and repository operations.

In a comparison of the relative amounts of radioactivity in a particular waste type, radionuclides of concern depend on the analysis being performed. For example, cesium-137 is the primary radionuclide of concern when reviewing preclosure impacts and shielding requirements. For postclosure impacts, the repository performance assessment identified technetium-99 and neptunium-237 as the nuclides that provide the greatest impacts. Plutonium-238 and -239 are shown in Chapter 7 to contribute the most to doses for the No-Action Alternative. Table A-2 presents the inventory of each of these radionuclides included in the Proposed Action. Figure A-4 shows that at least 92 percent of the total inventory of each of these radionuclides is in commercial spent nuclear fuel.

Table A-3. Commercial nuclear power reactors in the United States and their projected years of operation.[a]

Unit name	Reactor type[b]	State	Operations period[c]	Unit name	Reactor type[b]	State	Operations period[c]
Arkansas Nuclear One 1[d]	PWR	AR	1974-2034	Millstone 2	PWR	CT	1975-2015
Arkansas Nuclear One 2	PWR	AR	1978-2018	Millstone 3	PWR	CT	1986-2025
Beaver Valley 1	PWR	PA	1976-2016	Monticello	BWR	MN	1971-2010
Beaver Valley 2	PWR	PA	1978-2018	Nine Mile Point 1	BWR	NY	1969-2009
Big Rock Point	BWR	MI	1963-1997	Nine Mile Point 2	BWR	NY	1987-2026
Braidwood 1	PWR	IL	1987-2026	North Anna 1	PWR	VA	1978-2018
Braidwood 2	PWR	IL	1988-2027	North Anna 2	PWR	VA	1980-2020
Browns Ferry 1	BWR	AL	1973-2013	Oconee 1[d]	PWR	SC	1973-2033
Browns Ferry 2	BWR	AL	1974-2014	Oconee 2[d]	PWR	SC	1973-2033
Browns Ferry 3	BWR	AL	1976-2016	Oconee 3[d]	PWR	SC	1974-2034
Brunswick 1	BWR	NC	1976-2016	Oyster Creek	BWR	NJ	1969-2009
Brunswick 2	BWR	NC	1974-2014	Palisades	PWR	MI	1972-2007
Byron 1	PWR	IL	1985-2024	Palo Verde 1	PWR	AZ	1985-2024
Byron 2	PWR	IL	1987-2026	Palo Verde 2	PWR	AZ	1986-2025
Callaway	PWR	MO	1984-2024	Palo Verde 3	PWR	AZ	1987-2027
Calvert Cliffs 1[d]	PWR	MD	1974-2034	Peach Bottom 2	BWR	PA	1973-2013
Calvert Cliffs 2[d]	PWR	MD	1976-2036	Peach Bottom 3	BWR	PA	1974-2014
Catawba 1	PWR	SC	1985-2024	Perry 1	BWR	OH	1986-2026
Catawba 2	PWR	SC	1986-2026	Pilgrim 1	BWR	MA	1972-2012
Clinton	BWR	IL	1987-2026	Point Beach 1	PWR	WI	1970-2010
Comanche Peak 1	PWR	TX	1990-2030	Point Beach 2	PWR	WI	1973-2013
Comanche Peak 2	PWR	TX	1993-2033	Prairie Island 1	PWR	MN	1974-2013
Cooper Station	BWR	NE	1974-2014	Prairie Island 2	PWR	MN	1974-2014
Crystal River 3	PWR	FL	1977-2016	Quad Cities 1	BWR	IL	1972-2012
D. C. Cook 1	PWR	MI	1974-2014	Quad Cities 2	BWR	IL	1972-2012
D. C. Cook 2	PWR	MI	1977-2017	Rancho Seco	PWR	CA	1974-1989
Davis-Besse	PWR	OH	1977-2017	River Bend 1	BWR	LA	1985-2025
Diablo Canyon 1	PWR	CA	1984-2021	Salem 1	PWR	NJ	1976-2016
Diablo Canyon 2	PWR	CA	1985-2025	Salem 2	PWR	NJ	1981-2020
Dresden 1	BWR	IL	1959-1978	San Onofre 1	PWR	CA	1967-1992
Dresden 2	BWR	IL	1969-2006	San Onofre 2	PWR	CA	1982-2013
Dresden 3	BWR	IL	1971-2011	San Onofre 3	PWR	CA	1983-2013
Duane Arnold 1	BWR	IA	1974-2014	Seabrook 1	PWR	NH	1990-2026
Edwin I. Hatch 1	BWR	GA	1974-2014	Sequoyah 1	PWR	TN	1980-2020
Edwin I. Hatch 2	BWR	GA	1978-2018	Sequoyah 2	PWR	TN	1981-2021
Fermi 2	BWR	MI	1985-2025	Shearon Harris	PWR	NC	1987-2026
Fort Calhoun 1	PWR	NE	1973-2013	South Texas Project 1	PWR	TX	1988-2016
Ginna	PWR	NY	1969-2009	South Texas Project 2	PWR	TX	1989-2023
Grand Gulf 1	BWR	MS	1984-2022	St. Lucie 1	PWR	FL	1976-2016
Haddam Neck	PWR	CT	1968-1996	St. Lucie 2	PWR	FL	1983-2023
Hope Creek	BWR	NJ	1986-2026	Summer 1	PWR	SC	1982-2022
Humboldt Bay	BWR	CA	1962-1976	Surry 1	PWR	VA	1972-2012
H.B. Robinson 2	PWR	SC	1970-2010	Surry 2	PWR	VA	1973-2013
Indian Point 1	PWR	NY	1962-1974	Susquehanna 1	BWR	PA	1982-2022
Indian Point 2	PWR	NY	1973-2013	Susquehanna 2	BWR	PA	1984-2024
Indian Point 3	PWR	NY	1976-2015	Three Mile Island 1	PWR	PA	1974-2014
James A. FitzPatrick/ Nine Mile Point	BWR	NY	1974-2014	Trojan	PWR	OR	1975-1992
				Turkey Point 3	PWR	FL	1972-2012
Joseph M. Farley 1	PWR	AL	1977-2017	Turkey Point 4	PWR	FL	1973-2013
Joseph M. Farley 2	PWR	AL	1981-2021	Vermont Yankee	BWR	VT	1973-2012
Kewaunee	PWR	WI	1973-2013	Vogtle 1	PWR	GA	1987-2027
LaCrosse	BWR	WI	1967-1987	Vogtle 2	PWR	GA	1989-2029
LaSalle 1	BWR	IL	1970-2022	Columbia Generating Station	BWR	WA	1984-2023
LaSalle 2	BWR	IL	1970-2023				
Limerick 1	BWR	PA	1985-2024	Waterford 3	PWR	LA	1985-2024
Limerick 2	BWR	PA	1989-2029	Watts Bar 1	PWR	TN	1996-2035
Maine Yankee	PWR	ME	1972-1996	Wolf Creek	PWR	KS	1985-2025
McGuire 1	PWR	NC	1981-2021	Yankee-Rowe	PWR	MA	1963-1991
McGuire 2	PWR	NC	1983-2023	Zion 1	PWR	IL	1973-1997
Millstone 1	BWR	CT	1970-2010	Zion 2	PWR	IL	1974-1996

a. Source: DIRS 103493-DOE (1997, Appendix C).
b. PWR = pressurized-water reactor; BWR = boiling-water reactor.
c. As defined by current shutdown or full operation through license period (as of 1997), except as noted in Footnote d.
d. These plants have recently been granted 20-year operating license extensions. Several additional plants have applied for operating license extensions, and others could do so in the future.

Table A-7. Proposed Action spent nuclear fuel inventory (MTHM).[a]

Site	Fuel type[b]	1995 actual	1996-2011[c]	Total[d]	Equivalent assemblies	Site	Fuel type[b]	1995 actual	1996-2011[c]	Total[d]	Equivalent assemblies
Arkansas Nuclear One	PWR	643	466	1,109	2,526	Monticello	BWR	147	280	426	2,324
Beaver Valley	PWR	437	581	1,018	2,206	North Anna	PWR	570	613	1,184	2,571
Big Rock Point	BWR	44	14	58	439	Oconee	PWR	1,098	767	1,865	4,028
Braidwood	PWR	318	711	1,029	2,424	Oyster Creek	BWR	374	325	699	3,824
Browns Ferry	BWR	840	1,092	1,932	10,402	Palisades	PWR	338	247	585	1,473
Brunswick	Both	448	448	896	4,410	Palo Verde	PWR	556	1,118	1,674	4,082
Byron	PWR	404	664	1,068	2,515	Peach Bottom	BWR	908	645	1,554	8,413
Callaway	PWR	280	422	702	1,609	Perry	BWR	178	274	452	2,470
Calvert Cliffs	PWR	641	501	1,142	2,982	Pilgrim	BWR	326	201	527	2,853
Catawba	PWR	465	683	1,148	2,677	Point Beach	PWR	529	347	876	2,270
Clinton	BWR	174	303	477	2,588	Prairie Island	PWR	518	348	866	2,315
Comanche Peak	PWR	176	821	998	2,202	Quad Cities	BWR	813	464	1,277	6,953
Cooper	BWR	175	277	452	2,435	Rancho Seco	PWR	228	--[e]	228	493
Crystal River	PWR	280	232	512	1,102	River Bend	BWR	176	356	531	2,889
D. C. Cook	PWR	777	656	1,433	3,253	Salem/Hope Creek	Both	793	866	1,659	7,154
Davis-Besse	PWR	243	262	505	1,076	San Onofre	PWR	722	701	1,423	3,582
Diablo Canyon	PWR	463	664	1,126	2,512	Seabrook	PWR	133	292	425	918
Dresden	BWR	1,557	590	2,146	11,602	Sequoyah	PWR	452	570	1,023	2,218
Duane Arnold	BWR	258	208	467	2,545	Shearon Harris	Both	498	252	750	2,499
Edwin I. Hatch	BWR	755	692	1,446	7,862	South Texas Project	PWR	290	722	1,012	1,871
Fermi	BWR	155	368	523	2,898	St. Lucie	PWR	601	419	1,020	2,701
Fort Calhoun	PWR	222	157	379	1,054	Summer	PWR	225	301	526	1,177
Ginna	PWR	282	180	463	1,234	Surry	PWR	660	534	1,194	2,604
Grand Gulf	BWR	349	506	856	4,771	Susquehanna	BWR	628	648	1,276	7,172
H. B. Robinson	PWR	145	239	384	903	Three Mile Island	PWR	311	236	548	1,180
Haddam Neck	PWR	355	65	420	1,017	Trojan	PWR	359	--	359	780
Humboldt Bay	BWR	29	--	29	390	Turkey Point	PWR	616	458	1,074	2,355
Indian Point	PWR	678	486	1,164	2,649	Vermont Yankee	BWR	387	222	609	3,299
James A. FitzPatrick/ Nine Mile Point	BWR	882	930	1,812	9,830	Vogtle	PWR	335	745	1,080	2,364
Joseph M. Farley	PWR	644	530	1,174	2,555	Columbia Generating Station	BWR	243	338	581	3,223
Kewaunee	PWR	282	169	451	1,172						
La Crosse	BWR	38	--	38	333	Waterford	PWR	253	247	500	1,217
La Salle	BWR	465	487	952	5,189	Watts Bar	PWR	--	251	251	544
Limerick	BWR	432	711	1,143	6,203	Wolf Creek	PWR	226	404	630	1,360
Maine Yankee	PWR	454	82	536	1,421	Yankee-Rowe	PWR	127	--	127	533
McGuire	PWR	714	725	1,439	3,257	Zion	PWR	841	211	1,052	2,302
Millstone	Both	959	749	1,709	6,447	***Totals***		***31,926***	***31,074***	***63,000***	***218,700***

a. Source: DIRS 155725-CRWMS M&O (1998, all).
b. PWR = pressurized-water reactor; BWR = boiling-water reactor.
c. Projected.
d. To convert metric tons to tons, multiply by 1.1023.
e. -- = no spent nuclear fuel production.

determined that 51 radionuclides represent all of the health-significant species that can contribute to a radiological dose if released in an accident. The derivation of the list of radionuclides of interest in terms of impacts to the public is described in Appendix H, Section H.2.1.4.1. Tables A-9 and A-10 list these radionuclides and their inventories for average pressurized-water and boiling-water reactor spent nuclear fuel assemblies. The inventories are presented at the average decay years for each of the assemblies.

Table A-11 combines the average inventories (curies per MTHM) with the projected totals (63,000 MTHM and 105,000 MTHM) to provide a total projected radionuclide inventory for the Proposed Action and additional modules.

Table A-8. Inventory Modules 1 and 2 spent nuclear fuel inventory (MTHM).[a]

Site	Fuel type[b]	1995 actual	1996-2046[c]	Total[d]	Equivalent assemblies	Site	Fuel type[b]	1995 actual	1996-2046[c]	Total[d]	Equivalent assemblies
Arkansas Nuclear One	PWR	643	1,007	1,650	3,757	Monticello	BWR	147	390	537	2,924
Beaver Valley	PWR	437	1,395	1,832	3,970	North Anna	PWR	570	1,384	1,955	4,246
Big Rock Point	BWR	44	14	58	439	Oconee	PWR	1,098	1,576	2,674	5,774
Braidwood	PWR	318	1,969	2,287	5,385	Oyster Creek	BWR	374	470	844	4,619
Browns Ferry	BWR	840	2,508	3,348	18,024	Palisades	PWR	338	395	733	1,845
Brunswick	Both	448	992	1,440	7,355	Palo Verde	PWR	556	3,017	3,573	8,712
Byron	PWR	404	1,777	2,181	5,139	Peach Bottom	BWR	908	1,404	2,312	12,523
Callaway	PWR	280	1,008	1,288	2,953	Perry	BWR	178	732	910	4,974
Calvert Cliffs	PWR	641	1,069	1,710	4,466	Point Beach	PWR	529	614	1,143	2,961
Catawba	PWR	465	1,752	2,217	5,168	Prairie Island	PWR	518	692	1,210	3,234
Clinton	BWR	174	910	1,084	5,876	Quad Cities	BWR	813	1,020	1,834	9,982
Comanche Peak	PWR	176	2,459	2,635	5,816	Pilgrim	BWR	326	444	770	4,170
Cook	PWR	777	1,379	2,155	4,892	Rancho Seco	PWR	228	--[e]	228	493
Cooper	BWR	175	587	762	4,106	River Bend	BWR	176	956	1,132	6,153
Crystal River	PWR	280	525	805	1,734	Salem/Hope Creek	Both	793	2,452	3,245	11,584
Davis-Besse	PWR	243	582	825	1,757	San Onofre	PWR	722	1,321	2,043	5,144
Diablo Canyon	PWR	463	1,725	2,187	4,878	Seabrook	PWR	133	831	964	2,083
Dresden	BWR	1,557	984	2,541	13,740	Sequoyah	PWR	452	1,393	1,845	4,001
Duane Arnold	BWR	258	434	692	3,776	Shearon Harris	Both	498	707	1,205	3,535
Fermi	BWR	155	1,005	1,160	6,429	South Texas Project	PWR	290	2,029	2,319	4,286
Fort Calhoun	PWR	222	312	534	1,485	St. Lucie	PWR	601	1,010	1,611	4,265
Ginna	PWR	282	283	565	1,507	Summer	PWR	225	732	958	2,141
Grand Gulf	BWR	349	1,261	1,610	8,976	Surry	PWR	660	1,029	1,689	3,682
H. B. Robinson	PWR	145	364	509	1,197	Susquehanna	BWR	628	1,745	2,373	13,338
Haddam Neck	PWR	355	65	420	1,017	Three Mile Island	PWR	311	513	825	1,777
Hatch	BWR	755	1,517	2,272	12,347	Trojan	PWR	359	--	359	780
Humboldt Bay	BWR	29	--	29	390	Turkey Point	PWR	616	905	1,520	3,334
Indian Point	PWR	678	1,005	1,683	3,787	Vermont Yankee	BWR	387	434	822	4,451
James A. FitzPatrick/ Nine Mile Point	BWR	882	2,018	2,900	15,732	Vogtle	PWR	335	2,122	2,458	5,378
Joseph M. Farley	PWR	644	1,225	1,869	4,070	Columbia Generating Station	BWR	243	924	1,167	6,476
Kewaunee	PWR	282	330	612	1,591						
La Crosse	BWR	38	--	38	333	Waterford	PWR	253	685	938	2,282
La Salle	BWR	465	1,398	1,863	10,152	Watts Bar	PWR	--	893	893	1,937
Limerick	BWR	432	1,958	2,390	12,967	Wolf Creek	PWR	226	1,052	1,278	2,759
Maine Yankee	PWR	454	82	536	1,421	Yankee-Rowe	PWR	127	--	127	533
McGuire	PWR	714	1,813	2,527	5,720	Zion	PWR	841	211	1,052	2,302
Millstone	Both	959	1,695	2,655	8,930	***Totals***		***31,926***	***73,488***	***105,414***	***359,963***

a. Source: DIRS 155725-CRWMS M&O (1998, all).
b. PWR = pressurized-water reactor; BWR = boiling-water reactor.
c. Projected.
d. To convert metric tons to tons, multiply by 1.1023.
e. -- = no spent nuclear fuel production.

DOE used the fuel characteristics derived in Section A.2.1.5 and listed in Table A-6 to establish the fission product and radionuclide inventories of the pressurized-water and boiling-water reactor representative fuel assemblies used for accident analyses. For these analyses, DOE included a radionuclide contribution from activated corrosion products deposited on the surfaces of spent nuclear fuel assemblies during reactor operation. This material is called *crud*.

DOE used the fuel assembly surface concentration values in *Reexamination of Spent Fuel Shipment Risk Estimates* (DIRS 152476-Sprung et. al. 2000, all) to develop the radioactive inventory from crud. The crud contains eight radionuclides. However, because all of these radionuclides except cobalt-60 decay rapidly, after storage (aging) for 5 years or longer, cobalt-60 is the only significant radionuclide remaining. The surface concentration values at discharge from the reactor range from 2 to 140 microcuries per square centimeter for pressurized-water reactor fuel assemblies and from 11 to 595 microcuries per square centimeter for boiling-water reactor assemblies, based on measurements of fuel rods (DIRS 152476-Sprung et al. 2000, p. 7-48; DIRS 103696-Sandoval 1991, all). Due to the wide range in concentration values and the limited number of measurements, DOE elected to use the maximum (cobalt-60) crud concentration numbers (DIRS 152476-Sprung et al. 2000, p. 7-48).

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Table A-19. DOE spent nuclear fuel categories.[a,b,c]

	DOE SNF category	Typically from	Description of fuel
1.	Uranium metal	N-Reactor	Uranium metal fuel compounds with aluminum or zirconium alloy cladding
2.	Uranium-zirconium	HWCTR	Uranium alloy fuel compounds with zirconium alloy cladding
3.	Uranium-molybdenum	Fermi	Uranium-molybdenum alloy fuel compounds with zirconium alloy cladding
4.	Uranium oxide, intact	Commercial PWR	Uranium oxide fuel compounds with zirconium alloy or stainless-steel cladding in fair to good condition
5.	Uranium oxide, failed/ declad/aluminum clad	TMI core debris	Uranium oxide fuel compounds: (1) without cladding; (2) clad with zirconium alloy, Hastelloy, nickel-chromium, or stainless steel in poor or unknown condition; or (3) nondegraded aluminum clad
6.	Uranium-aluminide	ATR	Uranium-aluminum alloy fuel compounds with aluminum cladding
7.	Uranium-silicide	FRR MTR	Uranium silicide fuel compounds with aluminum cladding
8.	Thorium/uranium carbide, high-integrity	Fort St. Vrain	Thorium/uranium carbide fuel compounds with graphite cladding in good condition
9.	Thorium/uranium carbide, low-integrity	Peach Bottom	Thorium/uranium carbide fuel compounds with graphite cladding in unknown condition
10.	Plutonium/uranium carbide, nongraphite	FFTF carbide	Uranium carbide or plutonium-uranium carbide fuel compounds with or without stainless-steel cladding
11.	Mixed oxide	FFTF oxide	Plutonium/uranium oxide fuel compounds in zirconium alloy, stainless-steel, or unknown cladding
12.	Uranium/thorium oxide	Shippingport LWBR	Uranium/thorium oxide fuel compounds with zirconium alloy or stainless-steel cladding
13.	Uranium-zirconium hydride	TRIGA	Uranium-zirconium hydride fuel compounds with or without Incalloy, stainless-steel, or aluminum cladding
14.	Sodium-bonded	EBR-II driver and blanket, Fermi-I blanket	Uranium and uranium-plutonium metallic alloy with predominantly stainless-steel cladding
15.	Naval fuel	Surface ship/ submarine	Uranium-based with zirconium alloy cladding
16.	Miscellaneous	Not specified	Various fuel compounds with or without zirconium alloy, aluminum, Hastelloy, tantalum, niobium, stainless-steel or unknown cladding

a. Source: DIRS 104385-Fillmore (1998, all).
b. Abbreviations: SNF = spent nuclear fuel; HWCTR = heavy-water cooled test reactor; PWR = pressurized-water reactor; TMI = Three Mile Island; ATR = Advanced Test Reactor; FRR MTR = foreign research reactor – material test reactor; FFTF = Fast Flux Test Facility; LWBR = light-water breeder reactor; TRIGA = Training Research Isotopes—General Atomic; EBR-II = Experimental Breeder Reactor II.
c. For ongoing repository performance analyses, the 16 DOE fuel categories have been reduced to 11 categories (DIRS 118968-DOE 2000, all) since the publication of the Draft EIS. The reduction reflects a better understanding of the behavior of DOE fuels under repository conditions and allows the combining of some of the 16 DOE fuel categories. The reduced DOE fuel categories will help streamline future repository analyses of DOE fuels.

A.2.2.3 Present Storage and Generation Status

Table A-20 lists storage locations and inventory information on DOE spent nuclear fuels. During the preparation of the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (DIRS 101802-DOE 1995, all), DOE evaluated and categorized

Table A-20. National Spent Nuclear Fuel Database projection of DOE spent nuclear fuel locations and inventories to 2035.[a,b]

	Fuel category and name	Storage Site	No. of units[c]	Mass (kilograms)[d]	Volume (cubic meters)[e]	Fissile mass (kilograms)	Equivalent uranium mass (kilograms)	MTHM
1.	Uranium metal[f]	INEEL	85	4,500	0.7	13	1,700	1.7
		Hanford	100,000	2,160,000	200	25,000	2,100,000	2100
		SRS	350	120,000	18	110	17,000	17
		Totals	*100,435*	*2,284,500*	*218.7*	*25,123*	*2,118,700*	*2119*
2.	Uranium-zirconium	INEEL	69	120	0.7	34	40	0.04
3.	Uranium-molybdenum	INEEL	29,000	4,600	0.3	970	3,800	3.8
4.	Uranium oxide, intact	INEEL	14,000	150,000	41	2,200	80,000	80
		Hanford	87	44,000	11	240	18,000	18
		Totals	*14,087*	*194,000*	*52*	*2,440*	*98,000*	*99*
5.	Uranium oxide, failed/declad/aluminum clad	INEEL	2,000	340,000	140	2,200	83,000	84
		Hanford	13	270	4.2	4	160	0.2
		SRS	7,600	58,000	96	2,600	3,200	3.2
		Totals	*9,613*	*398,270*	*240.2*	*4,804*	*86,360*	*87*
6.	Uranium-aluminide	SRS	18,000	130,000	150	6,000	8,800	8.7
7.	Uranium-silicide	SRS	7,400	47,000	53	1,200	12,000	12
8.	Thorium/uranium carbide, high-integrity	FSV	1,500	190,000	130	640	820	15
		INEEL	1,600	130,000	82	350	440	9.9
		Totals	*3,100*	*320,000*	*212*	*990*	*1,260*	*25*
9.	Thorium/uranium carbide, low-integrity	INEEL	810	55,000	17	180	210	1.7
10.	Plutonium/uranium carbide, nongraphite	INEEL	130	140	0	10	73	0.08
		Hanford	2	330	0.1	11	64	0.07
		Totals	*132*	*470*	*0.1*	*21*	*137*	*0.2*
11.	Mixed oxide	INEEL	2,000	6,100	2.4	240	2,000	2.1
		Hanford	620	110,000	33	2,400	8,000	10
		Totals	*2,620*	*116,100*	*35.1*	*2,640*	*10,000*	*12*
12.	Uranium/thorium oxide	INEEL	260	120,000	18	810	810	50
13.	Uranium-zirconium hydride	INEEL	9,800	33,000	8.1	460	2,000	2
		Hanford	190	660	33	7	36	0.04
		Totals	*9,990*	*33,660*	*8.3*	*467*	*2,036*	*2*
15.	Naval fuel[g]	INEEL	300	4,400,000	888	64,000	65,000	65
16.	Miscellaneous	INEEL	1,500	33,000	11	360	5,500	7.7
		Hanford	73	1,700	0.2	30	130	0.2
		SRS	8,800	9,200	8.2	550	2,900	2.9
		Totals	*10,373*	*43,900*	*19.4*	*940*	*8,530*	*11*
Grand totals			***210,000***	***8,150,000***	***1,900***	***110,000***	***2,420,000***	***2,500***

a. Source: DIRS 148240-Dirkmaat (1998, all).
b. Abbreviations: SNF = spent nuclear fuel; INEEL = Idaho National Engineering and Environmental Laboratory; SRS = Savannah River Site; FSV = Fort St. Vrain.
c. Unit is defined as an assembly, bundle of elements, can of material, etc., depending on the particular spent nuclear fuel category.
d. To convert kilograms to pounds, multiply by 2.2046; to convert metric tons to tons, multiply by 1.1023.
e. To convert cubic meters to cubic yards, multiply by 1.3079.
f. N-Reactor fuel is stored in aluminum or stainless-steel cans at the K-East and K-West Basins. The mass listed in this table does not include the storage cans.
g. Information supplied by the Navy (DIRS 104356-Dirkmaat 1997, Attachment, p. 2).

all the materials listed in the table as spent nuclear fuel, in accordance with the definition in the Nuclear Waste Policy Act, as amended.

A.2.2.4 Final Spent Nuclear Fuel Form

For all spent nuclear fuel categories except 14, the expected final spent nuclear fuel form does not differ from the current or planned storage form. Before its disposal in the repository, candidate material would be in compliance with approved acceptance criteria.

Table A-23. Maximum heat generation for DOE spent nuclear fuel (watts per handling unit).[a,b]

	Category and fuel type	Maximum heat generation
1.	Uranium metal	18
2.	Uranium zirconium	90
3.	Uranium molybdenum	4
4.	Intact uranium oxide	1,000
5.	Failed/declad/aluminum clad uranium oxide	800
6.	Uranium aluminide	480
7.	Uranium silicide	1,400
8.	High-integrity thorium/uranium carbide	250
9.	Low-integrity thorium/uranium carbide	37
10.	Nongraphite plutonium/uranium carbide	1,800
11.	Mixed oxide	1,800
12.	Thorium/uranium oxide	600
13.	Uranium zirconium hydride	100
14.	Sodium-bonded	N/A[c]
15.	Naval fuel	4,250
16.	Miscellaneous	1,000

a. Sources: DIRS 104354-Dirkmaat (1997, Attachment, pp. 74 to 77); DIRS 104377-Dirkmaat (1998, Table A.2.2-3); DIRS 156933-Fillmore (2001, all).
b. Handling unit is a canister.
c. N/A = not applicable. Assumed to be treated and therefore part of high-level radioactive waste inventory (see Section A.2.2.1).

Table A-24. Required number of canisters for disposal of DOE spent nuclear fuel.[a,b]

	Hanford		INEEL		SRS	Naval	
Category	18-inch	25.3-inch	18-inch	24-inch	18-inch	Short	Long
1		440	6		9		
2			8				
3			70				
4	14	20	179	16			
5	1		406		425		
6					750		
7					225		
8			503[c]				
9			60				
10	2		3				
11	324		43				
12			24	47			
13	3		97				
14[d]							
15						200	100
16	5		39		2		
Totals	***349***	***460***	***1,438***	***63***	***1,411***	***200***	***100***

a. Sources: DIRS 104356-Dirkmaat (1997, Attachment, p. 2); Dirkmaat (DIRS 148240-1998, all).
b. INEEL = Idaho National Engineering and Environmental Laboratory; SRS = Savannah River Site.
c. Includes 334 canisters from Fort St. Vrain.
d. Assumed to be treated and therefore part of high-level radioactive waste inventory (see Section A.2.2.1).

Table A-25. Preliminary naval canister design parameters.[a]

Parameter	Short canister	Long canister
Maximum outside diameter (centimeters)[b,c]	169	169
Maximum outer length (centimeters)	475	539
Minimum loaded weight (metric tons)[d]	27	27
Maximum loaded weight (metric tons)	45	45

a. Source: DIRS 104354-Dirkmaat (1997, Attachment, pp. 86 to 88).
b. To convert centimeters to inches, multiply by 0.3937.
c. Right circular cylinder.
d. To convert metric tons to tons, multiply by 1.1023.

A.2.3 HIGH-LEVEL RADIOACTIVE WASTE

High-level radioactive waste is the highly radioactive material resulting from the reprocessing of spent nuclear fuel. DOE stores high-level radioactive waste at the Hanford Site, the Savannah River Site, and the Idaho National Engineering and Environmental Laboratory. Between 1966 and 1972, commercial chemical reprocessing operations at the Nuclear Fuel Services plant near West Valley, New York, generated a small amount of high-level radioactive waste at a site presently owned by the New York State Energy Research and Development Authority. These operations ceased after 1972. In 1980, Congress passed the West Valley Demonstration Project Act, which authorizes DOE to conduct, with the Research and Development Authority, a demonstration of solidification of high-level radioactive waste for disposal and the decontamination and decommissioning of demonstration facilities (DIRS 102588-DOE 1992, Chapter 3). This section addresses defense high-level radioactive waste generated at the DOE sites (Hanford Site, Idaho National Engineering and Environmental Laboratory, and Savannah River Site) and commercial high-level radioactive waste generated at the West Valley Demonstration Project.

A.2.3.1 Background

In 1985, DOE published a report in response to Section 8 of the Nuclear Waste Policy Act (of 1982) that required the Secretary of Energy to recommend to the President whether defense high-level radioactive waste should be disposed of in a geologic repository along with commercial spent nuclear fuel. That report, *An Evaluation of Commercial Repository Capacity for the Disposal of Defense High-Level Waste* (DIRS 103492-DOE 1985, all), provided the basis, in part, for the President's determination that defense high-level radioactive waste should be disposed of in a geologic repository. Given that determination, DOE decided to allocate 10 percent of the capacity of the first repository for the disposal of DOE spent nuclear fuel (2,333 MTHM) and high-level radioactive waste (4,667 MTHM) (DIRS 104384-Dreyfuss 1995, all; DIRS 104398-Lytle 1995, all).

Calculating the MTHM quantity for spent nuclear fuel is straightforward. It is determined by the actual heavy metal content of the spent fuel. However, an equivalence method for determining the MTHM in defense high-level radioactive waste is necessary because almost all of its heavy metal has been removed. A number of alternative methods for determining MTHM equivalence for high-level radioactive waste have been considered over the years. Four of those methods are described in the following paragraphs.

Historical Method. Table 1-1 of DIRS 103492-DOE (1985) provided a method to estimate the MTHM equivalence for high-level radioactive waste based on comparing the radioactive (curie) equivalence of commercial high-level radioactive waste and defense high-level radioactive waste. The method relies on the relative curie content of a hypothetical (in the early 1980s) canister of defense high-level radioactive waste from the Savannah River, Hanford, or Idaho site, and a hypothetical canister of vitrified waste from reprocessing of high-burnup commercial spent nuclear fuel. Based on commercial high-level radioactive waste containing 2.3 MTHM per canister (heavy metal has not been removed from commercial waste) and defense high-level radioactive waste estimated to contain approximately 22 percent of the

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radioactivity of a canister of commercial high-level radioactive waste, defense high-level radioactive waste was estimated to contain the equivalent of 0.5 MTHM per canister. Since 1985, DOE has used this 0.5 MTHM equivalence per canister of defense high-level radioactive waste in its consideration of the potential impacts of the disposal of defense high-level radioactive waste, including the analysis presented in this EIS. With this method, less than 50 percent of the total inventory of high-level radioactive waste could be disposed of in the repository within the 4,667 MTHM allocation for high-level radioactive waste. There has been no determination of which waste would be shipped to the repository, or the order of shipments.

Spent Nuclear Fuel Reprocessed Method. Another method of determining MTHM equivalence, based on the quantity of spent nuclear fuel reprocessed, would be to consider the MTHM in the high-level radioactive waste to be the same as the MTHM in the spent nuclear fuel before it was reprocessed. Using this method, less than 5 percent of the total inventory of high-level radioactive waste could be disposed of in the repository within the 4,667 MTHM allocation for high-level radioactive waste.

Total Radioactivity Method. Another method, the total radioactivity method, would establish equivalence based on a comparison of radioactivity inventory (curies) of defense high-level radioactive waste to that of a standard MTHM of commercial spent nuclear fuel. For this equivalence method the standard spent nuclear fuel characteristics are based on pressurized-water reactor fuel with uranium-235 enrichment of 3.11 percent and 39.65 gigawatt-days per MTHM burnup. Using this method, 100 percent of the total inventory of high-level radioactive waste inventory could be disposed of in the repository within the 4,667 MTHM allocation for high-level radioactive waste.

Radiotoxicity Method. Yet another method, the radiotoxicity method, uses a comparison of the relative radiotoxicity of defense high-level radioactive waste to that of a standard MTHM of commercial spent nuclear fuel, and is thus considered an extension of the total radioactivity method. Radiotoxicity compares the inventory of specific radionuclides to a regulatory release limit for that radionuclide, and uses these relationships to develop an overall radiotoxicity index. For this equivalence, the standard spent nuclear fuel characteristics are based on pressurized-water reactor fuel with uranium-235 enrichment of 3.11 percent, 39.65 gigawatt-days per MTHM burnup. Using this method, 100 percent of the total inventory of high-level radioactive waste could be disposed of in the repository within the 4,667 MTHM allocation for high-level radioactive waste.

A recent report (DIRS 103495-Knecht et al. 1999, all) describes four equivalence calculation methods and notes that, under the Total Radioactivity Method or the Radiotoxicity Method, all DOE high-level radioactive waste could be disposed of under the Proposed Action. Using different equivalence methods would shift the proportion of high-level radioactive waste that could be disposed of between the Proposed Action and Inventory Module 1 analyzed in Chapter 8, but would not change the cumulative impacts analyzed in this EIS. Regardless of the equivalence method used, the EIS analyzes the impacts from disposal of the entire inventory of high-level radioactive waste in inventory Module 1.

A.2.3.2 Sources

A.2.3.2.1 *Hanford Site*

The Hanford high-level radioactive waste materials discussed in this EIS include tank waste, strontium capsules, and cesium capsules (DIRS 104406-Picha 1997, Table RL-1). DOE has not declared other miscellaneous materials or waste at Hanford, either existing or forecasted, to be candidate high-level radioactive waste streams. Before shipment to the repository, DOE would vitrify the high-level radioactive waste into a borosilicate glass matrix and pour it into stainless-steel canisters.

A.2.3.2.2 *Idaho National Engineering and Environmental Laboratory*

The Idaho National Engineering and Environmental Laboratory has proposed three different high-level radioactive waste stream matrices for disposal at the proposed Yucca Mountain Repository—glass, ceramic, and metal. The glass matrix waste stream would come from the Idaho Nuclear Technology and Engineering Center and would consist of wastes generated from the treatment of irradiated nuclear fuels. The ongoing Argonne National Laboratory-West electrometallurgical treatment of DOE sodium-bonded fuels will generate both ceramic and metallic high-level radioactive waste matrices. DOE is developing the *Idaho High-Level Waste and Facilities Disposition Final Environmental Impact Statement* (see DIRS 155100-DOE 1999, all), to support decisions on managing the high-level radioactive waste at the Idaho Nuclear Technology and Engineering Center.

A.2.3.2.3 *Savannah River Site*

Savannah River Site high-level radioactive waste consists of wastes generated from the treatment of irradiated nuclear fuels. These wastes include various chemicals, radionuclides, and fission products that DOE maintains in liquid, sludge, and saltcake forms. The Defense Waste Processing Facility at the Savannah River Site mixes the high-level radioactive waste with glass-forming materials, converts it to a durable borosilicate glass waste form, pours it into stainless-steel canisters, and seals the canisters with welded closure plugs (DIRS 104406-Picha 1997, Attachment 4, p. 2).

Another source of high-level radioactive waste at the Savannah River Site is the immobilized plutonium addressed in Section A.2.4.

A.2.3.2.4 *West Valley Demonstration Project*

The West Valley Demonstration Project is responsible for solidifying high-level radioactive waste that remains from the commercial spent nuclear fuel reprocessing plant operated by Nuclear Fuel Services. The Project mixes the high-level radioactive waste with glass-forming materials, converts it to a durable borosilicate glass waste form, pours it into stainless-steel canisters, and seals the canisters with welded closure plugs.

A.2.3.3 Present Status

A.2.3.3.1 *Hanford Site*

The Hanford Site stores high-level radioactive waste in underground carbon-steel tanks. This analysis assumed that before vitrification, strontium and cesium capsules currently stored in water basins at Hanford would be blended with the liquid high-level radioactive waste. To date, Hanford has immobilized no high-level radioactive waste. Before shipping waste to a repository, DOE would vitrify it into an acceptable glass form. DOE has scheduled vitrification to begin in 2007 with an estimated completion in 2028.

A.2.3.3.2 *Idaho National Engineering and Environmental Laboratory*

Most of the high-level radioactive waste at the Idaho Nuclear Technology and Engineering Center (formerly the Idaho Chemical Processing Plant) is in calcined solids (calcine) stored at the Idaho National Engineering and Environmental Laboratory. The calcine, an interim waste form, is in stainless-steel bins in concrete vaults. Before shipment to a repository, DOE proposes to immobilize the high-level radioactive waste in a vitrified (glass) waste form. The Idaho Nuclear Technology and Engineering Center proposes to implement its vitrification program in 2020 and complete it in 2035 (DIRS 103497-INEEL 1998, pp. A-39 to A-42).

As discussed in Section A.2.2.1, Argonne National Laboratory-West began electrometallurgical treatment of EBR-II reactor fuel in 2000. The ceramic and metallic waste forms being produced will be stored onsite.

A.2.3.3.3 *Savannah River Site*

DOE stores high-level radioactive waste in underground tanks at the Savannah River Site. High-level radioactive waste that has been converted to a borosilicate glass form and DOE projects completion of the vitrification of the stored high-level radioactive waste by 2027 (DIRS 157008-DOE 2001, all).

A.2.3.3.4 *West Valley Demonstration Project*

High-level radioactive waste is stored in underground tanks at the West Valley site. High-level radioactive waste that has been converted into a borosilicate glass waste form is stored onsite. West Valley plans to complete its vitrification program by the Fall of 2002 (DIRS 102588-DOE 1992, Chapter 3).

A.2.3.4 Final Waste Form

The final waste form for high-level radioactive waste from the Hanford Site, Savannah River Site, Idaho Nuclear Technology and Engineering Center, and West Valley Demonstration Project would be a vitrified glass matrix in a stainless-steel canister.

The waste forms from Argonne National Laboratory-West will be ceramic and metallic waste matrices and will be in stainless-steel canisters similar to those used for Savannah River Site and Idaho Nuclear Technology and Engineering Center glass wastes.

A.2.3.5 Waste Characteristics

A.2.3.5.1 *Mass and Volume*

Hanford Site. The estimated volume of borosilicate glass generated by high-level radioactive waste disposal actions at Hanford will be 15,700 cubic meters (554,000 cubic feet); the estimated mass of the glass is 44,000 metric tons (48,500 tons) (DIRS 104407-Picha 1998, Attachment 1). The volume calculation assumes that strontium and cesium compounds from capsules currently stored in water basins would be blended with tank wastes before vitrification with no increase in product volume. This volume of glass could require as many as 14,500 canisters, nominally 4.5 meters (15 feet) long with a 0.61-meter (2-foot) diameter (DIRS 104407-Picha 1998, Attachment 1).

Idaho National Engineering and Environmental Laboratory. Table A-26 lists the volumes, masses, densities, and estimated number of canisters for the three proposed waste streams.

Savannah River Site. Based on Revision 8 of the High-Level Waste System Plan (DIRS 101904-Davis and Wells 1997, all), the Savannah River Site would generate an estimated 5,978 canisters of high-level radioactive waste (DIRS 104406-Picha 1997, Attachment 1). The canisters have a nominal outside diameter of 0.61 meter (2 feet) and a nominal height of 3 meters (10 feet). They would contain a total of approximately 4,240 cubic meters (150,000 cubic feet) of glass. The estimated total mass of high-level radioactive waste for repository disposal would be 11,600 metric tons (12,800 tons) (DIRS 104406-Picha 1997, Attachment 1). DOE has addressed the additional high-level radioactive waste canisters that DOE

Attachment 3

Excerpts from
WTP Contract

SOLICITATION, OFFER AND AWARD

1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700) > | RATING | PAGE 1 OF 1 PAGES

2. CONTRACT NO.	3. SOLICITATION NO.	4. TYPE OF SOLICITATION	5. DATE ISSUED	6. REQUISITION/PURCHASE NUMBER
DE-AC27-01RV14136	DE-RP27-00RV14136	[ ] SEALED BID (IFB) [X] NEGOTIATED (RFP)	August 31, 2000	27-00RV14136.000

7. ISSUED BY CODE

U.S. Department of Energy
Office of River Protection
Office of Business Management and Administration, H6-60
2440 Stevens Drive (or P. O. Box 450)
Richland, WA 99352

8. ADDRESS OFFER TO *(If other than Item 7)*

Same as Block 7
ATTN: Michael K. Barrett, Contracting Officer

NOTE: In sealed bid solicitations "offer" and "offeror" mean "bid" and "bidder"

SOLICITATION

9. Sealed offers in original and ______*_______ copies for furnishing the supplies or services in the Schedule will be received at the place specified in Item 8, or if handcarried, in the depository located in ** until ** local time ** *(Hour)* *(Date)*

*** See Section L Provision entitled "INSTRUCTIONS - GENERAL"**

**** See Section L Provision entitled "TIME, DATE AND PLACE OFFERS AND OTHER WRITTEN PROPOSAL INFORMATION ARE DUE"**

CAUTION - LATE Submissions, Modifications, and Withdrawals: See Section L, Provision No. 52.214-7 or 52.215-1. All offers are subject to all terms and conditions contained in this solicitation.

10. FOR INFORMATION CALL: >	A. NAME	B. TELEPHONE (NO COLLECT CALLS) AREA CODE	NUMBER	EXT.	C. E-MAIL ADDRESS
	Michael K. Barrett	**509**	**373-4143**		**michael_k_barrett@rl.gov**

11. TABLE OF CONTENTS

OFFER *(Must be fully completed by offeror)*

NOTE: Item 12 does not apply if the solicitation includes the provisions at 52.214-16, Minimum Bid Acceptance Period

12. In compliance with the above, the undersigned agrees, if this offer is accepted within *** calendar days *(60 calendar days unless a different period is inserted by the offeror)* from the date for receipt of offers specified above, to furnish any or all items upon which prices are offered at the price set opposite each item, delivered at the designated point(s), within the time specified in the schedule ***** See Section L Provision entitled "OFFER ACCEPTANCE PERIOD"**

13. DISCOUNT FOR PROMPT PAYMENT *(See Section I, Clause No. 52.232-8)* >	10 CALENDAR DAYS	20 CALENDAR DAYS	30 CALENDAR DAYS	CALENDAR DAYS
	%	%	%	%

14. ACKNOWLEDGEMENT OF AMENDMENTS (The offeror acknowledges receipt of amendments to the SOLICITATION for offerors and related documents numbered and dated:	AMENDMENT NO.	DATE	AMENDMENT NO.	DATE
	1	9/27/00		
	2	10/6/00		
	3	10/11/00		

15A. NAME AND ADDRESS OF OFFEROR — CODE — FACILITY

Bechtel National, Inc.
45 Fremont Street
San Francisco, CA 94105

16. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER *(Type or print)*

Ron Naventi, Senior Vice President

15B. TELEPHONE NO. AREA CODE	NUMBER	EXT.	15C. CHECK IF REMITTANCE ADDRESS IS DIFFERENT FROM ABOVE - ENTER SUCH ADDRESS IN SCHEDULE	17. SIGNATURE	18. OFFER DATE
415	768-2374		[ ]	Original Signature of R. F. Naventi on File	20-Oct-00

AWARD *(To be completed by Government)*

19. ACCEPTED AS TO ITEMS NUMBERED	20. AMOUNT	21. ACCOUNTING AND APPROPRIATION
All	See Section B.4	89X0242.91 39EW01J20

22. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION

[ ] 10 U.S.C. 2304(c)( ) [ ] 41 U.S.C. 253(c)( )

23. SUBMIT INVOICES TO ADDRESS SHOWN IN *(4 copies unless otherwise specified)* > ITEM: See Section G.4

24. ADMINISTERED BY *(If other than Item 7)* CODE

25. PAYMENT WILL BE MADE BY CODE

See Section G.4

26. NAME OF CONTRACTING OFFICER *(Type or print)*

Harry L. Boston, Acting Manager
Office of River Protection

27. UNITED STATES OF AMERICA

Orignial Signature of H. L. Boston on File
(Signature of Contracting Officer)

28. AWARD DATE

12/11/00

IMPORTANT - Award will be made on this Form, or on Standard Form 26, or by other authorized official written notice.

AUTHORIZED FOR LOCAL PRODUCTION
Previous edition is unusable

STANDARD FORM 33 (REV. 9-97)
Prescribed by GSA - FAR (48 CFR) 53.214(c)

SECTION C

STATEMENT OF WORK

SECTION C

STATEMENT OF WORK

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floors shall be identified. All crane structures, filter housings, and facility mechanical systems shall be identified. Seismic analysis for the facilities for Pretreatment, HLW Vitrification, LAW Vitrification, and support facilities shall be completed in accordance with DOE and Ecology requirements to support structural analysis, definition of the facility, the Limited Work Authorization Request, and Construction Authorization Request.

(17) Mechanical Flow Diagrams: The Contractor shall prepare mechanical handling diagrams for the Pretreatment, HLW Vitrification, LAW Vitrification, Analytical Laboratory, and Balance of Facilities. The diagrams shall be prepared with sufficient detail to support the hazards analysis review and the operations research model. The diagrams shall identify mechanical equipment and each step and sequence of the operation.

(18) Analytical Laboratory Facility Design: The Contractor shall further develop and provide the sampling and analysis requirements to support process control, environmental compliance and waste form qualification for DOE approval (Table C.5-1.1, Deliverable 3.6). The information shall include sample locations, sample purpose, analysis requirements, and frequency and turnaround times. Results of the assessment of process tank capacities and process operations will be used to verify and establish the specification and design of the Analytical Laboratory to support the WTP.

Reserve capacity in the Analytical Laboratory, to the extent there is any, shall be utilized for "limited technology testing" or increase throughput (e.g., Pretreatment, LAW and HLW capacity changes). Limited technology testing includes investigation of anticipated WTP operational performance, evaluation of process upsets, process improvements, analytical methods optimization, and qualification of new instruments.

Limited technology testing capabilities shall include: compositional and physical property analysis of the waste feeds; and small scale testing of the cross-flow filtration, sludge washing and leaching, cesium (Cs) ion exchange, and LAW and HLW glass melting processes. Testing of the waste feeds shall be completed to confirm planned operational flowsheets for the tank wastes to be treated in the WTP. Testing may be done in alternative facilities with prior DOE approval.

The Contractor shall identify samples from WTP operations that will be analyzed at non-WTP analytical facilities. The definitions of the outsourced samples shall include sample type and analyses required. The identification of the outsourced samples is to be included in the Sampling and Analyses Plan used to support the requirements definition for the Analytical Laboratory.

The Analytical Laboratory Facility design shall incorporate features and capability necessary to ensure efficient WTP operations and meet all permitting, process control, authorization basis, and waste form qualification requirements.
The design should be validated with information from tank utilization modeling of the process tankage, and operational research modeling of the treatment process, as appropriate.

(19) Site Layout Drawings: The Contractor shall complete all site layout drawings, which shall include the exterior arrangement of all facilities and structures on the site in relation to one another, and their exterior interface points with all piping and electrical systems. The drawings shall identify all above-grade and below-grade structures, piping, and electrical systems. The drawings will reflect requirements

Commissioning following:

- The Contractor's completion of a management assessment to evaluate the readiness of facilities and personnel to initiate cold commissioning based upon the Minimum Core Requirements identified in DOE Order 425.1C, *Startup and Restart of Nuclear Facilities*. The results of the management assessment shall be provided to DOE.

- Identification of the status of the authorization basis implementation, permits and safety program implementation, and any remaining construction scope that requires completion before simulant introduction.

The Contractor shall not proceed with introduction of simulants without DOE approval. The Contractor shall notify DOE that Cold Commissioning has commenced.

(3) Testing:

(i) Waste Form Qualification Tests: The Contractor shall complete WTP waste form qualification testing during cold commissioning to demonstrate the production of acceptable non-radioactive products (ILAW and IHLW) and secondary wastes in accordance with the Secondary Wastes Compliance Plan (Table C.5-1.1, Deliverable 6.1), ILAW Product Compliance Plan (Table C.5-1.1, Deliverable 6.3), and IHLW Waste Form Compliance Plan (Table C.5-1.1, Deliverable 6.2). Applicable process unit operations, sampling and analysis, process control systems, and operating procedures shall be utilized in these qualification tests in a manner that represents planned operations with actual wastes. Test results will be evaluated and documented as part of the waste form qualification reports identified in Standard 6, *Product Qualification, Characterization, and Certification*.

(ii) Cold Commissioning Capacity Tests:

Cold commissioning testing shall be conducted to demonstrate the capacity of the WTP as noted in Table C.6-5.1. Waste form products and secondary wastes will be produced in accordance with the qualification strategies and requirements identified in the Secondary Wastes Compliance Plan (Table C.5-1.1, Deliverable 6.1), ILAW Product Compliance Plan (Table C.5-1.1, Deliverable 6.3), and IHLW Waste Form Compliance Plan (Table C.5-1.1, Deliverable 6.2), and meet the relevant specification and interface requirements. The results shall be provided to DOE for review and approval. (Table C.5-1.1, Deliverable 5.4).

The Cold Commissioning Capacity Tests shall test the individual facility operations in terms of function and capacity. Applicable facility system components, both process and mechanical, shall be tested.

The water washing, caustic, and oxidative leaching process steps shall be performed consistent with the process model used to develop Table C.6-5.1 and the process steps as defined in Standard 2, Deliverable 2.10. Leaching effectiveness is not a criterion for acceptability of Cold Commissioning Capacity Test results.

Specification 1: Immobilized High-Level Waste Product

1.1 Scope: This Specification defines requirements for the IHLW product, a waste product. The IHLW product is a vitrified borosilicate glass waste form for ultimate disposal in the proposed geologic repository.

1.2 Requirements:

1.2.1 References:

1.2.1.1 CRD. DOE/RW-0406. Revision 8. September 12, 2007. *Civilian Radioactive Waste Management Systems Requirements Document*, ICN 1. U.S. Department of Energy, Office of Civilian Radioactive Waste Management. Washington, D.C.

1.2.1.2 DOE Manual 435.1-1 CHG-1. July 9, 1999. *Radioactive Waste Management Manual.* U.S. Department of Energy, Washington, D.C.

1.2.1.3 WASRD. DOE/RW-0351. Revision 5. May 31, 2007. *Waste Acceptance System Requirements Document (WASRD).* U.S. Department of Energy, Office of Civilian Radioactive Waste Management, Washington, D.C. **(M047) (M114)**

1.2.1.4 WAPS. DOE/EM-0093. Revision 2. December 1996. *Waste Acceptance Product Specifications for Vitrified High-Level Waste Forms,* U.S. Department of Energy, Washington D.C. **(M047) (M114)**

1.2.1.5 IICD. DOE/RW-0511. Revision 4. March 7, 2008. Integrated Interface Control Document, Volume 1. *High-Level Radioactive Waste and U.S. Department of Energy and Naval Spent Nuclear Fuel to the Civilian Radioactive Waste Management System.* U.S. Department of Energy, Washington D.C.

1.2.1.6 MOA. Revision 2. February 2007. *Memorandum of Agreement for Acceptance of Spent Nuclear Fuel and High-Level Nuclear Waste (MOA) between Environmental Management (EM) U.S. Department of Energy (DOE), Washington, DC. and Office of Civilian Radioactive Waste Management (DOE-RW or OCRWM).* U.S. Department of Energy, Washington, D.C. **(M114)**

1.2.1.7 QARD. DOE/RW-0333P. Revision 20. January 2008. *Quality Assurance Requirements and Description for the Civilian Radioactive Waste Management Program (QARD).* U.S. Department of Energy, Office of Civilian Radioactive Waste Management, Washington, D.C.

1.2.1.8 40 CFR 268. "Land Disposal Restrictions." *Code of Federal Regulations.* U.S. Environmental Protection Agency, Washington, D.C.

1.2.1.9 WAC 173-303. "Dangerous Waste Regulations." *Washington Administrative Code,* as amended.

1.2.1.10 HWMA. *Hazardous Waste Management Act.*

1.2.1.11 RCRA. *Resource Conservation and Recovery Act.*

1.2.2 Product Requirements:

1.2.2.1 Immobilized High-Level Waste:

1.2.2.1.1 Product and Disposal Requirements: The IHLW product shall meet the requirements established in the *Waste Acceptance Product Specifications* (WAPS) and the supporting documents *Waste Acceptance Systems Requirements Document* (WASRD), and Integrated Interface Control Document (IICD). The WAPS, WASRD, and IICD identify the requirements of DOE-RW for acceptance of IHLW for disposal at a federal geologic repository. A *Memorandum of Agreement for Acceptance of Department of Energy Spent Nuclear Fuel and High-Level Nuclear Waste*, (MOA) sets forth, specifies, and lists the programmatic protocols, technical data, specifications and requirements for producing an acceptable IHLW waste form for disposal at a federal geologic repository. The *Quality Assurance Requirements and Description for the Civilian Radioactive Waste Management Program* (QARD) establishes the minimum QA requirements for compliance with the US Department of Energy, Office of Civilian Radioactive Waste Management (DOE-RW, or OCRWM). These requirements must be met before the IHLW waste glass canisters will be accepted by the DOE Office of River Protection (ORP) for onsite interim storage and later formal acceptance by DOE-RW for final disposal.

1.2.2.1.2 Canister System: The reference canister system used to contain the IHLW product shall be a 4.5-meter long by 0.61-meter diameter canister system with a neck and flange design similar to that used at the West Valley Demonstration Project.

1. "Fill Height: Fill height shall be equivalent to at least 87 percent of the volume of the empty canister. The average fill height over all the canisters shall be at least 95 percent of the volume of the empty canister."
2. "Maximum Heat Generation Rate: The maximum heat generation rate for any single canister shall not exceed 1500 watts per canister when delivered to DOE."
3. "Surface Contamination Limitations: Removable contamination on the external surfaces of the package shall not exceed 3,670 Bq/m^2 for alpha and 36,700 Bq/m^2 for beta-gamma. **(M047)**

1.2.2.1.3 Condition at Delivery: At time of delivery to DOE, the HLW form shall stand upright without support on a flat horizontal surface and properly fit into a right-circular, cylindrical cavity (64-cm diameter and 4.51-m length).

1.2.2.1.4 Dangerous and Hazardous Waste Requirements: The WTP shall be designed, constructed, and operated so that the IHLW product does not designate as characteristic or criteria for dangerous waste or extremely hazardous waste pursuant to WAC 173-303-070, and is not restricted from land disposal pursuant to WAC 173-303-140 and 40 CFR 268, "Land Disposal Restrictions."

1.2.2.1.5 Product Loading: Loading of non-volatile components in Envelope D shall be achieved such that the concentration of at least one of the waste components or waste component combinations in Table TS-1.1, *Minimum Component Limits in High-Level Waste Glass*, exceeds its minimum weight percent in HLW glass as identified in Table TS-1.1 (e.g., for a high-iron waste, the waste product shall incorporate at least 12.5 weight percent [wt%] iron oxide from the waste into the glass). The product loading shall not cause the limits in any other requirement of this specification to be violated. Product waste loading shall be calculated on an average basis for each batch transfer of Waste Envelope D. The waste loading may be adjusted downward if necessary to comply with Universal Treatment Standards leaching requirements.

1.2.3 Handling Requirements:

1.2.3.1 Product Handling: The canister shall have a point of connection that allows vertical upward, vertical downward, and horizontal motion while attached to a hoist and grapple.

1.3 Quality Assurance: A QA Program for the IHLW form development, qualification, characterization, and certification is required and shall be consistent with DOE/RW-0333P. **(M152)**

1.4 Inspection and Acceptance: The DOE-approved IHLW Waste Form Compliance Plan (Table C.5-1.1, Deliverable 6.2), described in Standard 6, *Product Qualification, Characterization, and Certification*, defines the content and delivery of documentation required to demonstrate compliance with the requirements of this specification. Product inspection and acceptance shall be performed in accordance with Specification 13, *Waste Product Inspection and Acceptance*, and the required IHLW QA Program.

Table TS-1.1 Minimum Component Limits in High-Level Waste Glass

Component	Weight Percent in HLW Glass
Fe_2O_3	12.5
Al_2O_3	11.0
$Na_2O + K_2O$	15.0
ZrO_2	10.0
UO_2	8.0
ThO_2	4.0
CaO	7.0
MgO	5.0
BaO	4.0
CdO	3.0
NiO	3.0
PbO	1.0
TiO_2	1.0
Bi_2O_3	2.0
P_2O_5	3.0
F	1.7
$Al_2O_3 + ZrO_2$	14.0
$Al_2O_3 + ZrO_2 + Fe_2O_3$	21.0
MgO + CaO	8.0

Component	Weight Percent in HLW Glass
Cr_2O_3	0.5
SO_3	0.5
Ag_2O	0.25
$Rh_2O_3 + Ru_2O_3 + PdO$	0.25
Any single waste oxide (exclusive of Si) not specifically identified in Specification 8, TS-8.1 and 8.4	0.2
Total of all other waste oxides (exclusive of Si) not specifically identified in this table.	8.0

Attachment 4

Excerpts from
Waste Acceptance System Requirements Document
(WASRD), Rev. 5 (May 31, 2007)

DOC.20070522.0007

DOE/RW-0351 **QA:** QA

Office of Civilian Radioactive Waste Management

Civilian Radioactive Waste Management System

Waste Acceptance System Requirements Document

Revision 5

Effective Date: 31 May 2007

Preparer: M. A. Popa — Date: 18 May 07

Approval: C.A. Kouts, Director, Waste Management Office (signed for CAK) — Date: 5/18/2007

Dahl Aff - 000077

1. INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this document is to establish waste acceptance technical requirements for the U.S. Department of Energy's (DOE) Civilian Radioactive Waste Management System (CRWMS). These requirements and functions consist of two types: (a) internal CRWMS requirements derived from the Civilian Radioactive Waste Management System Requirements Document (CRD) (DOE 2006a) as illustrated in Figure 1, and (b) acceptance criteria imposed by the CRWMS on spent nuclear fuel (SNF) and high-level waste (HLW) delivered into the CRWMS.

The purpose also includes, in addition to the CRWMS-related requirements that flow down to the Waste Acceptance System Requirements Document (WASRD) from the CRWMS, requirements and functions that, by mutual agreement with external organizations, are described, codified, and regulated by the WASRD. These other functions and requirements include:

- Federal Waste Custodians require their contractors to conform to WASRD requirements;
- The WASRD is the agreed upon reference source of waste acceptance criteria to which Federal Waste Custodians must conform for their wastes to be received by the repository;
- The WASRD is the agreed upon reference source for conformance verification criteria (this effort is in its very earliest stages);
- The WASRD is the reference for the details of Office of Civilian Radioactive Waste Management (RW)/ Office of Environmental Management (EM) agreement on technical information needs to support receipt;
- The WASRD is the official reference for the Integrated Acceptance Schedule (also in its early stages).

The scope of the WASRD is all SNF and HLW bound for the repository.

3. REQUIREMENTS ON THE CRWMS

3.1 PRIMARY REGULATORY REQUIREMENTS

This section identifies the primary requirements on the CRWMS as established by the federal laws and regulations that define them.

The Waste Acceptance element shall comply with the applicable provisions of 42USC10101 et seq "The Nuclear Waste Policy Act of 1982" as amended.

The Waste Acceptance element shall comply with the applicable provisions of 10 CFR (Code of Federal Regulations) Part 20, "Standards for Protection Against Radiation."

The Waste Acceptance element shall comply with the applicable provisions of 10 CFR Part 63, "Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada."

The Waste Acceptance element shall comply with the applicable provisions of 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."

The Waste Acceptance element shall comply with the applicable provisions of 10 CFR Part 73, "Physical Protection of Plants and Materials."

The Waste Acceptance element shall comply with the applicable provisions of 10 CFR Part 75, "Safeguards on Nuclear Materials-Implementation of U.S./IAEA (International Atomic Energy Agency) Agreement."

The Waste Acceptance element shall accept nuclear waste in accordance with 10 CFR Part 961, "Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste."

The Waste Acceptance element shall comply with the applicable provisions of 29 CFR Part 1910, "Occupational Safety and Health Standards."

The Waste Acceptance element shall comply with the applicable provisions of 10 CFR Part 21, "Reporting of Defects and Noncompliance."

3.2 WASTE ACCEPTANCE ELEMENT PERFORMANCE REQUIREMENTS

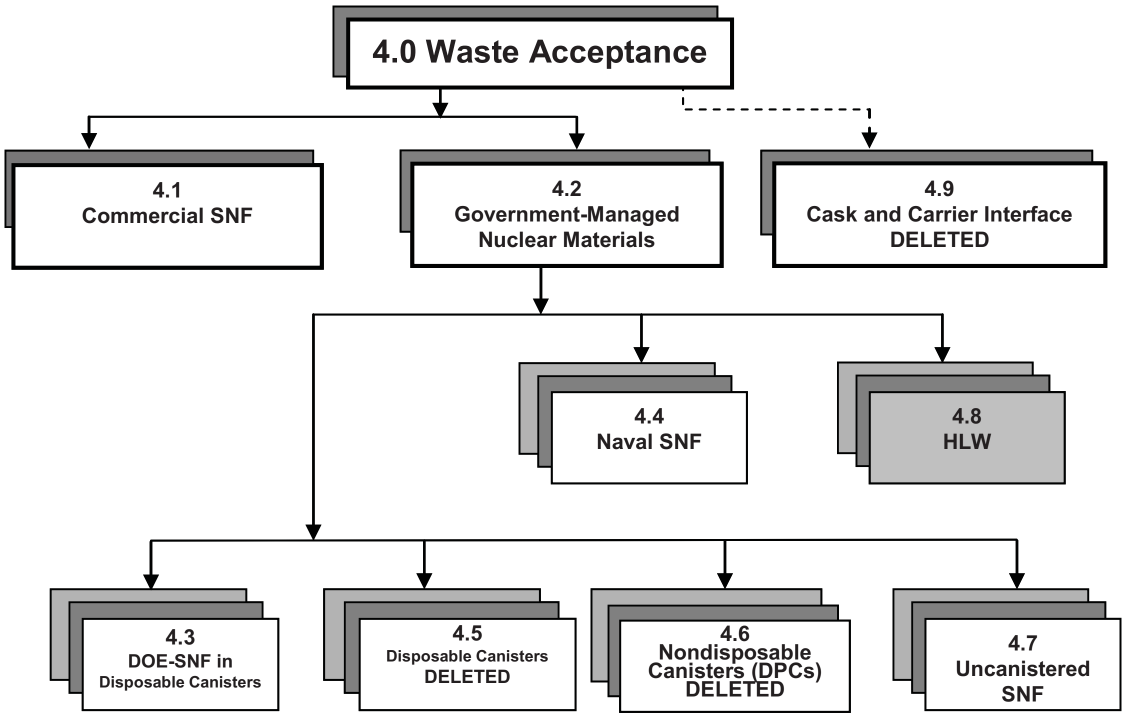
This section contains the requirements allocated to the Waste Acceptance Element by the CRD.

A. The Waste Acceptance Element shall collect necessary information in support of CRWMS activities. The type of data required includes, but is not limited to, the following:

1. Contracts and Fees Information - Purchaser Contracts; Custodian and Producer Agreements and changes thereto; records of fee payments;

2. Planning and Scheduling Information - Delivery Commitment Schedules, Delivery

4.8 SPECIFIC REQUIREMENTS FOR HIGH-LEVEL WASTE



This section covers additional acceptance criteria for defense HLW, vitrified plutonium waste form, and commercial HLW in addition to those in Section 4.2 that collectively represent the acceptance criteria for canistered vitrified HLW. At this time, the composition of the vitrified plutonium waste form is not finalized. Once the final composition is determined, additional requirements will be added to this section, as necessary, specific to the vitrified plutonium waste form.

4.8.1 Durability and Phase Stability of Vitrified HLW

A. The standard vitrified HLW form shall be borosilicate glass sealed inside an austenitic stainless steel canister(s) with a concentric neck and lifting flange.

B. Product Consistency

1. The Producer shall demonstrate control of waste form production by comparing production samples or process control information, separately or in combination to the Environmental Assessment benchmark glass (Jantzen 1993) using the Product Consistency Test (ASTM C1285-97) or equivalent.

2. For acceptance, the mean concentrations of lithium, sodium, and boron in the leachate, after normalization for the concentrations in the glass, shall be less than those of the benchmark glass.

4.8.2 HLW Canister Design and Materials of Construction

The HLW canister materials shall preclude chemical, electrochemical, or other reactions (such as internal corrosion) of the canister or waste package such that there will be no adverse effect on normal handling, transportation, storage, emplacement, containment, isolation, or on performance under abnormal occurrences such as a canister drop accident and premature failure in the repository.

4.8.3 Dimensional Envelope for HLW Canisters

At time of delivery, the canistered HLW form shall stand upright without support on a flat horizontal surface and fit without forcing into a right-circular, cylindrical cavity (64 cm [25 in] diameter and 3.01 m [9.88 ft] length or alternatively 64 cm [25 in] diameter and 4.51 m [14.8 ft] length). HLW canister dimensions are found in the Integrated Interface Control Document, Volume 1 (DOE 2007b).

4.8.4 Filled HLW Canister Weights

The weight of filled HLW canister shall not exceed 9,260 pounds (4,200 kg).

4.8.5 Capability to Lift HLW Canisters Vertically with Remote Handling Fixtures

For canisters of HLW accepted into the CRWMS:

A. The Producer shall provide a grapple design suitable for use in loading or unloading a transportation cask with a standard 3.0 m [9.9 ft] HLW canister or a standard 4.5 m [15 ft] canister;

B. The grapple, when attached to the hoist and engaged with the flange, shall be capable of moving the canistered waste form in the vertical direction;

C. The grapple shall be capable of being remotely engaged with and remotely disengaged from the HLW canister flange;

D. The grapple shall be capable of being engaged or disengaged while remaining within the projected diameter of the waste form canister;

E. The grapple shall include safety features that prevent inadvertent release of a suspended canistered waste form.

4.8.6 HLW Canister Sealing

Canisters shall be sealed and leak tight. Canister gas leak rates shall be less than $1x10^{-4}$ ref-cc/sec ($6.10 X 10^{-6}$ in^3/sec.) (DOE 1996).

4.8.7 HLW Canister Labeling

Canisters shall have a legible, unique identifier that is permanently attached to the canister and is traceable to the permanent records of the canister and its contents.

4.8.8 HLW Canister Drop

The HLW canisters shall be capable of withstanding a drop of 7 meters (23.0 ft) onto a flat, essentially unyielding surface without breaching or dispersing radionuclides.

4.8.9 Free Liquid in Canisters Containing HLW

Sealed HLW canisters shall contain no residual water beyond that condensing from water vapor inside the canister as it cools.

4.8.10 Radionuclide Content in High-Level Waste

Radionuclide estimate waste form requirements are listed in sections 5.4.1.B(2), 5.4.3.C and the NRC Form 741.

4.8.11 Criticality Potential in Canisters Containing HLW

A. Preclosure Criticality:

For acceptance, HLW producers shall provide qualified data to ensure RW can demonstrate preclosure safety requirements relating to criticality, as described below. Specific technical information needs are identified in Section 5.4.1.B(10).

To meet 10 CFR Part 63 preclosure safety requirements, it must be demonstrated that the HLW and its canister, in conjunction with the facility systems, structures, and components, shall provide the basis for ensuring subcriticality at the time of delivery to the geologic repository and during all subsequent handling operations, including all event sequences that are important for criticality and have at least one chance in 10,000 of occurring before permanent closure. To provide assurance of subcriticality, the methodology will account for the biases and uncertainties in both the calculations and experimental data used in the development of the effective neutron multiplication factor (k_{eff}), and will also include a technically justified administrative margin (Δkm) following the guidance in Fuel Cycle Safety & Safeguards-Interim Staff Guidance-10.

B. Post Closure Criticality:

For acceptance, HLW producers shall provide qualified data to ensure RW can demonstrate postclosure safety requirements relating to criticality, as described below. Specific technical information needs are identified in Section 5.4.1.B(10). Postclosure criticality analyses are based on performance of the co-disposal waste package configurations consisting of both DOE SNF and HLW canisters.

The methodology described in the Disposal Criticality Analysis Methodology Topical Report (YMP/TR-004Q) shall be used to meet 10 CFR Part 63 postclosure criticality requirements to demonstrate that the total probability of criticality for all HLW canisters shall not cause the total probability of criticality for all waste forms to exceed one chance in 10,000 over the first 10,000 years after permanent closure of the repository.

4.8.12 HLW Canister Surface Contamination

The Producer shall inspect the canistered waste form and remove visible waste glass from the exterior surface of the canister prior to shipment.

4.8.13 Thermal Output in Canisters Containing HLW

Total heat generation rate for canisters containing HLW shall not exceed 1500 watts (5120 BTU/hr) per canister (Arenaz 2006) at the year of shipment.

5.3 NAVAL SNF

For naval SNF, the technical information needs are identified in the document Scope of the Geologic Disposal Technical Information Package for Naval SNF Canisters, Revision 2 S5G Only, (NNPP 2006) and Section V.A of the 2000 Memorandum of Agreement between NNPP and RW (Bowman and Itkin 2000). Similar technical information is required for other naval fuels.

5.4 HLW

This section presents the technical information needs concerning High Level Waste.

5.4.1 Prior to the Start of Production

A. Prior to the start of production of canistered waste forms, the waste producer shall provide all of the documentation (current revision, either as hard copy or as electronic media) required under the Memorandum of Agreement (DOE 2007a). This shall include the EM Waste Acceptance Product Specifications, WCP, Waste Form Qualification Report, and any supporting documentation required by these documents.

B. Information provided shall include the following:

(1) The chemical composition and crystalline phase projections for the vitrified HLW. Information on the chemical composition shall include identification of the oxides of elements present in concentrations greater than 0.5 percent by weight (of glass) and an estimate of the uncertainty of these concentrations for vitrified HLW.

(2) Estimates of the total facility inventory and individual canister inventory of radionuclides (in Curies) that have half-lives longer than 10 years and that are or will be present in concentrations greater than 0.05 percent of the total radioactive inventory. The estimates shall be indexed to the years 2010 and 3110. The Producer shall also report the estimate of the uncertainty in the radionuclide inventories.

(3) The Time-Temperature-Transformation diagrams for the vitrified HLW and identification of temperature limits (if any) necessary to preserve the properties of the vitrified HLW.

(4) Identification of the method to be used to ensure consistency of production batches, and any other information necessary to establish post-closure performance of the waste forms (e.g. identification of organic compounds that may be present and estimated quantities).

(5) Canister material.

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(6) Canister dimensions (at the time of acceptance).

(7) Canister lifting and handling arrangements.

(8) Canister labeling conventions.

(9) Information required to assess the canister drop performance during preclosure and to assess repository postclosure performance including information regarding particulates, pyrophorics, combustibles, explosives, or other relevant factors that all may come into play in a Category II event sequence. This is likely to be a detailed list much of which has not yet been determined. This information need will be developed more fully in a future revision of the WASRD.

(10) Information required to assess canister criticality, both pre- and postclosure. This list of information includes, but is not limited to, the following general categories: quantities (number of canisters, amount/canister), waste form dimensions (goes to geometry and concentration of fissile material), quantities of fissile materials present by isotope, materials of construction of canisters and any internal components (goes to influences on chemistry during the postclosure period) and waste form degradation and dissolution characteristics (postclosure geometry and criticality). Information supplied in each category is expected to be as specific as possible. This list will be amplified as new issues arise.

(11) Estimated maximum gamma and neutron dose rates at the canister surface.

(12) Projected distribution of canister thermal outputs, including the maximum.

(13) Method used to assign individual canister Metric Ton Heavy Metal (MTHM) content for accounting against the repository 70,000 MTHM capacity limit as specified in Section 114d of the Nuclear Waste Policy Act of 1982 (as amended).

5.4.2 During Production

Waste producers shall report annually on the production of HLW waste forms, projections of remaining production, and any production trends which may influence the properties of canistered waste forms relative to the information provided in response to 5.4.1. Annual reports shall also identify non-conforming waste forms and the status of actions to address the non-conforming condition(s).

5.4.3 Prior to Delivery

Prior to delivery, waste producers shall provide all relevant production and storage records of canistered waste forms to be delivered, including any documentation of actions required to address non-conforming conditions. Included in the documentation to be provided is the following:

A. Identification (Label information) of the specific waste form(s) to be delivered.

B. Certification of compliance with WASRD requirements and that all actions required resolving non-conforming conditions have been completed. Completed and approved HLW Production Records in conjunction with relevant shipping and storage records may be used as proof of compliance certification.

C. Production Records and Storage and Shipping Records for individual canistered waste forms to be delivered. These Records along with required information in the WCP and Waste Form Qualification Report shall address product composition, product consistency, radionuclide inventory, sub-criticality, thermal output, gamma and neutron dose rates, post-production temperature history, presence of organic materials (compounds and amounts) and parameters important to canister drop performance. (JR EML on 19 Feb 07).

D. Metric Ton Heavy Metal (MTHM) assignment for each individual canister to be delivered.

5.4.4 At Delivery

A. At the time of delivery, waste producers shall provide a completed DOE/NRC Form-741, Nuclear Material Transaction Reports, traceable to the labels of individual canisters to be shipped. Waste producers shall also certify that canisters loaded into shipping casks are in compliance with the cask Certificate of Compliance.

B. EM shall provide, at the time of acceptance, signed documentation that verifies that each accepted waste form conforms to CRWMS acceptance criteria. EM shall transfer to the authorized RW representative the original or copy (either Hard Copy or Electronic Media) of the completed records package, for acceptance. Such documentation could include HLW Shipping and Storage Records and HLW Production Records.

7. PROJECTED INITIAL ACCEPTANCE CAPACITY AND OVERALL SCHEDULE

Table 7-1 provides an initial projection of the schedule for accepting Government Managed Nuclear Materials and commercial SNF. The estimated schedule shown for commercial SNF reflects the planning basis documented in Table 1 of the Civilian Radioactive Waste Management System Requirements Document (DOE 2006b, Section 3.2.1.D).

The NWPA requires that the NRC "…shall prohibit the emplacement in the first repository of a quantity of spent fuel containing in excess of 70,000 metric tons of heavy metal or a quantity of solidified high-level radioactive waste resulting from the reprocessing of such a quantity of spent fuel until such a time as a second repository is in operation." DOE plans to co-emplace DOE wastes and commercial SNF in a manner that ensures that repository thermal goals are met. When the emplacement limit is reached, emplacement will stop until a second repository is in operation or appropriate changes to the NWPA are enacted.

Table 7-1 identifies the total projected quantities of the various waste types expected to require geologic disposal and current plans for their acceptance by the CRWMS. The schedule is based on the following:

- Government-managed nuclear waste will be accepted by the CRWMS as early as Year 1 of operations.
- The 1995 EM plan (Lytle 1995; Dreyfus 1995) to include DOE SNF and naval SNF among the early DOE wastes to be delivered to the CRWMS.
- The December 1996 plan (62 FR 1095) by the Department of Navy (and DOE as cooperating agency) to use a naval canister system for loading, storing, transporting, and possibly disposing of naval SNF.
- The DOE plan (DOE 1999, page S.2) to immobilize approximately 13 metric tons of the surplus-weapons plutonium considered unsuitable for use in MOX fuel.
- The court-ordered agreement between DOE, the U.S. Navy, and the State of Idaho to remove the entire inventory of DOE SNF and naval SNF out of Idaho by January 1, 2035 (Public Service 1995) and that naval SNF shall be among the early shipments to the repository (paragraph D.1.e of the court order).
- Final receipt rates for naval SNF are to be negotiated to be consistent with the Memorandum of Agreement between RW and NNPP (Bowman, F.L. and Itkin, I. 2000).

The rates in this schedule are targets only and do not create any binding legal obligation on the Department of Energy.

Table 7.1: Descriptions of Wastes to be Sent to Repository

Waste Type	Inventory	Description of Waste Form
CSNF	**63,000 MTHM**	Approx. 221,000 BWR and PWR assemblies from commercial nuclear power generation, to be received at Yucca Mountain as Transport-Aging-Disposal canisters, dual-purpose canisters, or uncanistered, intact SNF assemblies. Approx. 1,700 MOX assemblies from conversion of 34 MT of surplus plutonium are included, but may require further testing/characterization. Also includes some commercial-origin DOE SNF for which fees have already been paid.
CHLW		275 canisters of vitrified HLW resulting from the commercial reprocessing of 640 MTHM of SNF. The HLW is owned by New York State and stored at the West Valley Demonstration Project. This HLW is characteristically identical to the HLW at Savannah River. There is currently no acceptance agreement between DOE and New York for this HLW.
DOE HLW	**4,667 MTHM**	Up to 9,334 canisters, either 10- or 15-foot long from reprocessing activities at Hanford, Savannah River, and Idaho National Laboratory. The reference HLW is a vitrified borosilicate glass with a range of waste loadings. (DOE uses a conversion of 0.5 MTHM per canister of DOE HLW to establish the basis to meet the NWPA statutory limit.) Only qualitative information is available to addresses approximately 870 canisters of a vitrified plutonium waste form (not part of the 4,667 MTHM inventory unless qualified for disposal) pending selection of the final waste form composition. The reference vitrified plutonium waste form includes a 10-foot canister of HLW containing up to 28 small cans containing lanthanide borosilicate (LaBS) glass incorporating the approximately 13 MT of surplus plutonium. An additional 100 canisters of HLW glass would also be generated due to the displacement of HLW from Pu.
DOE SNF	**2,333 MTHM**	Spent nuclear fuel from various non-commercial sources, such as weapons production, research and testing, and naval nuclear propulsion. DOE SNF is divided into 34 analytical groups based on fuel properties, cladding integrity, enrichment, etc. DOE SNF would be placed into disposable canisters at its current storage sites in Savannah River, Hanford, and Idaho National Laboratory. The canisters could be either a standardized canister (10-foot x 18", 10-foot x 24", 15-foot x 18", or 15-foot x 24"), multicanister overpacks, or naval spent fuel canisters (long or short). It is estimated that a range of 2,500 to 5,000 canisters will be produced. EM's current estimate is for approximately 3,500 canisters.

The inventories and allocation are consistent with CRWMS technical requirements baseline documents (e.g. CRWMS Requirements Document, MGR System Requirements Document, and Waste Acceptance System Requirements Document). Note that EM and RW agreed, for planning purposes, on a split of 1/3 of the 10% allocation of defense inventory to be for DOE SNF and 2/3 to be for HLW. This split can be readjusted upon joint agreement between EM and RW.

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For further information, contact:

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Yucca Mountain Site
Characterization Office
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89036-0307**

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1-800-967-3477

Attachment 5

Excerpts from
Draft Tank Closure and Waste Management EIS
October 2009

DOE/EIS-0391

Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington

Volume 1
Chapters 1–12

U.S. Department of Energy

October 2009

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Dahl Aff - 000092

4.1.14.2.5 Secondary Waste

4.1.14.2.5.1 Mixed Transuranic Waste

As shown in Table 4–85, the estimated volume of mixed TRU waste would be less than the waste volume assumed under both Waste Management Alternative 2, Disposal Group 2, and Waste Management Alternative 3, Disposal Group 2; therefore, this volume should not impact existing TRU waste treatment and storage facilities and would be within the capacity allocated to Hanford for disposal at WIPP (DOE 1997:S-10).

4.1.14.2.5.2 Low-Level and Mixed Low-Level Radioactive Wastes

As shown in Table 4–85, Tank Closure Alternative 2A accounts for the disposal of 34,331 cubic meters (44,905 cubic yards) of LLW and 39,254 cubic meters (51,344 cubic yards) of MLLW that would be generated by the tank closure program. LLW and MLLW would be disposed of in an IDF. The amount of LLW and MLLW generated under this Tank Closure alternative is consistent with that accounted for under Waste Management Alternative 2, Disposal Group 2, and Waste Management Alternative 3, Disposal Group 2. Therefore, no long-term storage capacity would be needed; the impacts of treating and disposing of this waste in an IDF(s) are evaluated under Waste Management Alternative 2, Disposal Group 2, and Waste Management Alternative 3, Disposal Group 2.

4.1.14.2.5.3 Hazardous Waste

As shown in Table 4–85, a total of 79,203 cubic meters (103,598 cubic yards) of hazardous waste would be generated during construction and operations. For two peak years (2092–2093), hazardous waste would be generated at 31,380 cubic meters (41,045 cubic yards) per year.

4.1.14.2.5.4 Nonhazardous Waste

As shown in Table 4–85, the estimated volume of nonhazardous waste would be 2,647 cubic meters (3,462 cubic yards). This waste would be sent for offsite disposal in a local landfill. This additional waste load would have only a minor impact on the handling and accumulation of nonhazardous solid waste at Hanford.

4.1.14.2.5.5 Liquid Process Waste

As shown in Table 4–85, the estimated volume of low-level radioactive liquid process waste would be 9,691 liters (2,560 gallons). This waste would be treated on site.

4.1.14.3 Alternative 2B: Expanded WTP Vitrification; Landfill Closure

4.1.14.3.1 Waste Inventories

Table 4–86 presents the estimated waste volumes generated under Alternative 2B. Under this Tank Closure alternative, closure activities would include the removal of ancillary equipment and the top 4.6 meters (15 feet) of soil from two tank farms. This tank closure waste would be disposed of in the new RPPDF.

4.1.14.3.2 High-Level Radioactive Waste

As shown in Table 4–86, 14,220 cubic meters (18,600 cubic yards) of IHLW canisters and 400 cubic meters (523 cubic yards) of cesium and strontium canisters would be generated. DOE expects that the IHLW canisters would be stored on site.

DOE/EIS-0391

Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington

Reader's Guide

U.S. Department of Energy

October 2009

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READER'S GUIDE

INTRODUCTION

This Reader's Guide serves as an introduction and guide to the contents of the U.S. Department of Energy's (DOE's) *Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington (TC & WM EIS)* to highlight the key features of the reasonable alternatives and to help readers review the technical analyses presented in this environmental impact statement (EIS). Included here are descriptions of the proposed actions; the scope of this EIS; the alternatives evaluated; and the organization of this EIS itself. Readers are encouraged to use this guide to assist them in navigating through the complex information presented in this *TC & WM EIS*.

PROPOSED ACTIONS

The Hanford Site (Hanford), located in southeastern Washington State, has a waste inventory of about 206 million liters (54.5 million gallons) of mixed radioactive and chemically hazardous waste resulting from defense production activities conducted during the Cold War years. This waste is stored in 177 large and 61 smaller underground storage tanks and is a major potential risk to public health and the environment. DOE proposes to reduce this risk by updating its waste storage methodology and retrieving, treating, and disposing of key elements of this waste inventory. This EIS addresses the potential environmental impacts for three sets of proposed actions at Hanford: tank closure, Fast Flux Test Facility (FFTF) decommissioning, and waste management.

Figure 1 is a simplified process flow diagram displaying the general flow of waste from the single-shell tanks (SSTs) and double-shell tanks (DSTs) through the proposed treatment, interim storage, and disposal options. For the reader's ease, the flow diagram does not reflect a single alternative or set of alternatives; instead, the diagram displays all the options that were analyzed under the 17 proposed alternatives (11 for tank closure, 3 for FFTF decommissioning, and 3 for waste management). A distinction between current and proposed facilities is also made in Figure 1 to assist the reader in understanding which capabilities currently exist and which proposed additional capabilities were analyzed.

SCOPE

The scope of this *TC & WM EIS* includes analyses of the potential environmental impacts and relative cost consequences of proposed actions and reasonable alternatives for accomplishing the proposed actions. These analyses focused on three key elements:

1. Revising and updating the analyses of the August 1996 *Tank Waste Remediation System, Hanford Site, Richland, Washington, Final Environmental Impact Statement* (*TWRS EIS*), as well as subsequent supplement analyses, which addressed retrieval, treatment, and disposal of the tank waste, by also evaluating the impacts of different scenarios for final closure of Hanford's SST system.

2. Evaluating the potential environmental impacts of proposed activities to decommission FFTF, a nuclear test reactor, and associated auxiliary facilities at Hanford, including management of the waste generated by the decommissioning process (such as remote-handled special components [RH-SCs]) and disposition of Hanford's inventory of radioactively contaminated bulk sodium from FFTF and other onsite facilities.

Retrieval: Waste from the tanks would not be retrieved.

Treatment: No vitrification or treatment capacity would be built after 2008. Ongoing WTP construction would be terminated, and the WTP site would be isolated pending some future use, if any. No immobilized low-activity waste (ILAW) or immobilized high-level radioactive waste (IHLW) would be produced.

Disposal: The waste in the SST and DST systems would remain in the tank farms indefinitely.

Closure: Tank closure would not be addressed under this alternative. DOE would maintain security and management of the site for a 100-year administrative control period. During this period, DOE would continue to store and conduct routine monitoring of the waste in the SSTs, DSTs, and miscellaneous underground storage tanks.

Tank Closure Alternative 2: Implement the *Tank Waste Remediation System EIS* Record of Decision with Modifications

Tank Closure Alternative 2 would implement the decisions made in the Record of Decision for the *TWRS EIS* and considered in three supplement analyses completed through 2001. Under this alternative, all waste retrieved from the tanks would be vitrified, resulting in either an ILAW or IHLW glass product.

Tank Closure Alternative 2 consists of two subalternatives: (1) Tank Closure Alternative 2A: Existing WTP Vitrification; No Closure and (2) Tank Closure Alternative 2B: Expanded WTP Vitrification; Landfill Closure, as described below.

Tank Closure Alternative 2A: Existing WTP Vitrification; No Closure

Storage: DOE would continue current waste management operations using existing tank storage facilities. Because all of the DSTs will exceed their 40-year design life during the approximate 80-year period of waste retrieval, they would be replaced in a phased manner through 2054.

Retrieval: Using currently available liquid-based waste retrieval and leak detection systems, waste would be retrieved to the minimum goal of the Hanford Federal Facility Agreement and Consent Order, also known as the Tri-Party Agreement (TPA), i.e., residual waste would not exceed 10.2 cubic meters (360 cubic feet) for the 100-series tanks or 0.85 cubic meters (30 cubic feet) for the smaller 200-series tanks, corresponding to 99 percent retrieval. This approach would be the same under Tank Closure Alternative 2B.

Treatment: The existing WTP configuration (two high-level radioactive waste [HLW] melters and two low-activity waste [LAW] melters) would operate at a theoretical maximum capacity (TMC) of 6 metric tons of glass IHLW per day and 30 metric tons of glass ILAW per day. Treatment would start in 2018, and both HLW and LAW treatment would end in 2093. All of the waste streams routed to the WTP would be pretreated, although technetium-99 removal would not occur. The WTP would need to be replaced after 60 years due to design-life constraints. No supplemental or transuranic (TRU) waste treatment is proposed. The cesium and strontium capsules would be retrieved from the WESF, de-encapsulated, and treated in the WTP.

Disposal: LAW immobilized via the WTP would be disposed of on site in an IDF. IHLW would be stored on site until disposition decisions are made and implemented. This approach would be the same under Tank Closure Alternative 2B.

Closure: Tank closure would not be addressed under this alternative. For analysis purposes, administrative control of the tank farms would cease following a 100-year period ending in 2193.

Tank Closure Alternative 2B: Expanded WTP Vitrification; Landfill Closure

Storage: DOE would continue current waste management operations using existing tank storage facilities. No new DSTs would be required, but four new waste receiver facilities (WRFs), which are below-grade lag storage and minimal waste treatment facilities, would be constructed.

Retrieval: Using currently available liquid-based waste retrieval and leak detection systems, waste would be retrieved to the TPA minimum goal, i.e., residual waste would not exceed 10.2 cubic meters (360 cubic feet) for the 100-series tanks or 0.85 cubic meters (30 cubic feet) for the smaller 200-series tanks, corresponding to 99 percent retrieval. This approach would be the same under Tank Closure Alternative 2A.

Treatment: The existing WTP configuration (two HLW melters and two LAW melters) would be supplemented with expanded LAW vitrification capacity (an addition of four LAW melters) to provide a vitrification TMC of 6 metric tons of glass IHLW per day and 90 metric tons of glass ILAW per day. Treatment would start in 2018 and end in approximately 2040 (for HLW) and 2043 (for LAW). All of the waste streams routed to the WTP would be pretreated, including technetium-99 removal from the LAW stream. No facilities would need to be replaced. No supplemental or TRU waste treatment is proposed. The cesium and strontium capsules would be retrieved from the WESF, de-encapsulated, and treated in the WTP.

Disposal: LAW immobilized via the WTP would be disposed of on site in an IDF. IHLW would be stored on site until disposition decisions are made and implemented. This approach would be the same under Tank Closure Alternative 2A.

Closure: As operations are completed, the SST system at Hanford would be closed as a Resource Conservation and Recovery Act (RCRA) hazardous waste landfill unit under Section 173-303 of the *Washington Administrative Code* (WAC 173-303), "Dangerous Waste Regulations," and DOE Order 435.1, *Radioactive Waste Management*, as applicable, or it would be decommissioned under DOE Order 430.1B, *Real Property Asset Management*. The tanks and ancillary equipment would be filled with grout to immobilize the residual waste, prevent future tank subsidence, and discourage intruder access. Soil would be removed down to 4.6 meters (15 feet) at the BX and SX tank farms and replaced with clean soil from onsite sources. The removed contaminated soils and ancillary equipment would be disposed of on site in the River Protection Project Disposal Facility (RPPDF), a new facility similar to an IDF. The closed tank systems and six sets of adjacent cribs and trenches (ditches) would be covered with an engineered modified RCRA Subtitle C barrier. Postclosure care would continue for 100 years.

Tank Closure Alternative 3: Existing WTP Vitrification with Supplemental Treatment Technology; Landfill Closure

This alternative consists of three subalternatives: (1) Tank Closure Alternative 3A: Existing WTP Vitrification with Thermal Supplemental Treatment (Bulk Vitrification); Landfill Closure, (2) Tank Closure Alternative 3B: Existing WTP Vitrification with Nonthermal Supplemental Treatment (Cast Stone); Landfill Closure, and (3) Tank Closure Alternative 3C: Existing WTP Vitrification with Thermal Supplemental Treatment (Steam Reforming); Landfill Closure. These subalternatives would involve the use of either thermal or nonthermal treatment technologies to supplement the WTP treatment processes. TRU tank waste would be packaged and interim-stored pending shipment to the Waste Isolation Pilot Plant (WIPP) for disposal.

The 90 percent retrieval level would be equal to residual tank waste of no more than 102 cubic meters (3,600 cubic feet) for the 100-series tanks or 8.5 cubic meters (300 cubic feet) for the smaller 200-series tanks.

Treatment: The existing WTP configuration (two HLW melters and two LAW melters) would be supplemented with expanded LAW vitrification capacity (an addition of one LAW melter) to provide a vitrification TMC of 6 metric tons of glass IHLW per day and 45 metric tons of glass ILAW per day. All waste streams routed to the WTP would be pretreated, although technetium-99 removal would not occur as part of WTP pretreatment. Treatment would start in 2018 and end in approximately 2034. This alternative considers implementation of a sulfate removal technology following WTP pretreatment that would potentially reduce the amount of glass produced in the WTP by increasing the waste loading in the ILAW glass. WTP capacity would be supplemented with additional waste treatment capacity to immobilize a portion of the LAW. Supplemental treatment of the LAW would occur in both the 200-East and 200-West Areas and consist of a combination of cast stone treatment in the 200-East Area and bulk vitrification treatment in the 200-West Area. The waste stream feed for the 200-East Area Cast Stone Facility would be pretreated in the WTP, excluding technetium-99 removal. In the 200-West Area, the waste feed would be pretreated in a new Solid-Liquid Separations Facility. A separate portion of the tank waste (approximately 11.8 million liters [3.1 million gallons]) would be designated as mixed TRU waste and packaged for disposal at WIPP. The cesium and strontium capsules would be retrieved from the WESF, de-encapsulated, and treated in the WTP.

Disposal: LAW immobilized both via the WTP and external to the WTP would be disposed of on site in an IDF. IHLW would be stored on site until disposition decisions are made and implemented. Mixed TRU waste would be packaged and stored on site in a new storage facility, pending disposal at WIPP.

Closure: As operations are completed, the SST system would be closed as an RCRA hazardous waste landfill unit under WAC 173-303, "Dangerous Waste Regulations," and DOE Order 435.1, *Radioactive Waste Management*, or it would be decommissioned under DOE Order 430.1B, *Real Property Asset Management*. The tanks and ancillary equipment would be filled with grout to immobilize the residual waste, prevent long-term degradation of the tanks, and discourage intruder access. The tank systems (tanks, ancillary equipment, and soils) and the six sets of adjacent cribs and trenches (ditches) would be closed in place and covered with the Hanford barrier (a barrier with performance characteristics that exceed RCRA requirements for disposal of hazardous waste). To support this schedule, SST system ancillary equipment outside the boundaries of the surface barriers would not be removed or decontaminated. Postclosure care would continue for 100 years.

Tank Closure Alternative 6: All Waste as Vitrified HLW[2]

This alternative consists of three subalternatives: (1) Alternative 6A: All Vitrification/No Separations; Clean Closure (Base and Option Cases), (2) Alternative 6B: All Vitrification with Separations; Clean Closure (Base and Option Cases), and (3) Alternative 6C: All Vitrification with Separations; Landfill Closure. These alternatives evaluate an all-vitrification case wherein all vitrified waste would be managed as HLW.

[2] Alternatives 6A, 6B, and 6C of this EIS evaluate management of tank waste as HLW combined with different closure scenarios. The purpose of Alternative 6A is to evaluate the bounding case for no-separation scenarios. The DOE Manual 435.1-1, "*Radioactive Waste Management Manual,*" waste incidental to reprocessing evaluation determination process is not required for treatment of the waste under these alternatives.

Tank Closure Alternative 6A: All Vitrification/No Separations; Clean Closure (Base and Option Cases)

Storage: DOE would continue current waste management operations using existing tank storage facilities that would be modified as needed to support SST waste retrieval and treatment. New DSTs would be required after the existing DSTs reach the end of their design life.

Retrieval: Using currently available liquid-based retrieval and leak detection systems and a final chemical wash step, waste would be retrieved to a volume corresponding to 99.9 percent retrieval, equal to residual tank waste of no more than 1 cubic meter (36 cubic feet) for the 100-series tanks or 0.08 cubic meters (3 cubic feet) for the smaller 200-series tanks. This approach would be the same under Tank Closure Alternative 6B.

Treatment: The existing WTP configuration would be modified to process all waste as HLW through expanded HLW vitrification capacity. This new WTP configuration (five HLW melters and no LAW melters) would provide a total vitrification TMC of 15 metric tons of glass IHLW per day. Treatment would start in 2018 and end in approximately 2163, requiring two WTP replacement facilities due to design-life constraints. There would be no pretreatment, LAW treatment, or technetium-99 removal. No supplemental or TRU waste treatment is proposed. The cesium and strontium capsules would be retrieved from the WESF, de-encapsulated, and treated in the WTP.

Disposal: IHLW canisters would be stored on site until disposition decisions are made and implemented. Replacement of the canister storage facilities would be required after a 60-year design life. The HLW debris from clean closure would be managed as HLW and stored on site.

Closure: Clean closure of all twelve 200-East and 200-West Area SST farms following deactivation would involve removal of all tanks, associated ancillary equipment, and contaminated soil to a depth of 3 meters (10 feet) directly beneath the tank base. These materials would be packaged as HLW for onsite storage in shielded boxes. Where necessary, deep soil excavation would also be conducted to remove contamination plumes within the soil column. The new PPF would process the highly contaminated deep soil to render it acceptable for onsite disposal. The liquid waste stream from the PPF soil washing would be thermally treated in the PPF and disposed of on site in an IDF. The washed soils would be disposed of in the RPPDF. Clean closure of the SST system would preclude the need for postclosure care. The six sets of adjacent cribs and trenches (ditches) would be covered with an engineered modified RCRA Subtitle C barrier (Base Case). Optional clean closure of these cribs and trenches (ditches) would occur under the Option Case. This approach would be the same under Tank Closure Alternative 6B.

Tank Closure Alternative 6B: All Vitrification with Separations; Clean Closure (Base and Option Cases)

Storage: DOE would continue current waste management operations using existing tank storage facilities. No new DSTs would be required, but four new WRFs would be constructed. This approach would be the same under Tank Closure Alternative 6C.

Retrieval: Using currently available liquid-based retrieval and leak detection systems and a final chemical wash step, waste would be retrieved to a volume corresponding to 99.9 percent retrieval, equal to residual tank waste of no more than 1 cubic meter (36 cubic feet) for the 100-series tanks or 0.08 cubic meters (3 cubic feet) for the smaller 200-series tanks. This approach would be the same under Tank Closure Alternative 6A.

Treatment: The existing WTP configuration (two HLW melters and two LAW melters) would be supplemented with expanded LAW vitrification capacity (an addition of four LAW melters) to provide a

Table 4. Roadmap to the Tank Closure Alternatives *(continued)*

<table>
<tr><th colspan="10">TANK CLOSURE ALTERNATIVE 2B:
Expanded WTP Vitrification; Landfill Closure</th></tr>
<tr><th colspan="2">STORAGE</th><th colspan="2">RETRIEVAL</th><th colspan="2">TREATMENT</th><th colspan="2">DISPOSAL</th><th colspan="2">CLOSURE</th></tr>
<tr>
<td colspan="2">Key Features
• 4 waste receiver facilities
• No new double-shell tanks</td>
<td colspan="2">Key Features
• 99 percent tank waste retrieval
• Liquid-based retrieval technologies
• Current leak detection technology
• Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank</td>
<td colspan="2">Key Features
• Waste treatment: 2018–2043
• 6 MTG/day (2 HLW melters) × 90 MTG/day (6 LAW melters)
• Tc-99 removal
• No sulfate removal
• No tank-derived TRU waste treatment</td>
<td colspan="2">Key Features
• ILAW disposal on site
• IHLW storage includes CSB + 4 additional vaults</td>
<td colspan="2">Key Features
• Landfill closure (modified RCRA Subtitle C barrier)
• Upper 4.6 meters (15 feet) of soil in BX and SX tank farms and ancillary equipment removed
• 100-year postclosure care</td>
</tr>
<tr>
<td colspan="2">Potential Issues
• Construction of 4 waste receiver facilities</td>
<td colspan="2">Potential Issues
• Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank</td>
<td colspan="2">Potential Issues
• Construction of expanded WTP</td>
<td colspan="2">Potential Issues
• ILAW disposal on site
• No waste acceptance criteria for HLW melters (stored indefinitely)</td>
<td colspan="2">Potential Issues
• Landfill closure of all single-shell tank farms with 1 percent residual waste and adjacent cribs and trenches (ditches)
• Benefit of removing upper 4.6 meters (15 feet) of soil in BX and SX tank farms</td>
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• 2.2.1
• 2.2.2.1
• 2.5.2.2.2
• D.1
• E.1</td>
<td>Impacts
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• 4.1.4.3 AQ
• 4.1.10.3 NO
• 4.1.11.3 FA</td>
<td>Description
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• 2.5.2.2.2
• D.1
• E.1</td>
<td>Impacts
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• 4.1.6.3 WR
• 4.1.9.3 S
• 4.1.10.3 NO
• 4.1.11.3 FA
• 5.1.1.3 GW
• 5.1.2.3 HH
• 5.1.3.3 LER</td>
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• 2.5.2.2.2
• D.1
• E.1</td>
<td>Impacts
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• 4.1.4.3 AQ
• 4.1.6.3 WR
• 4.1.7.3 ER
• 4.1.9.3 S
• 4.1.10.3 NO
• 4.1.11.3 FA
• 4.1.14 .3 WM
• 5.1.1.3 GW
• 5.1.2.3 HH
• 5.1.3.3 LER</td>
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• D.1
• E.1</td>
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• 4.1.7.3 ER
• 4.1.11.3 FA
• 4.1.12.3 T
• 4.1.14.3 WM
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• 4.1.14 .3 WM
• 5.1.1.3 GW
• 5.1.2.3 HH
• 5.1.3.3 LER</td>
</tr>
</table>

Note: "Key Features" include alternative configurations, treatment dates, and assumptions. "Potential Issues" include topics that may be environmental impact drivers or are expected to be of interest to readers. "Description" identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. "Impacts" identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

Key: AQ=Air Quality; CSB=Canister Storage Building; EIS=environmental impact statement; ER=Ecological Resources; FA=Facility Accidents; GW=Groundwater; HH=Human Health; HLW=high-level radioactive waste; IHLW=immobilized high-level radioactive waste; ILAW=immobilized low-activity waste; LAW=low-activity waste; LER=Long-Term Ecological Risk; LR=Land Resources; MTG=metric tons of glass; NO=Normal Operations; RCRA=Resource Conservation and Recovery Act; S=Socioeconomics; T=Transportation; Tc-99=technetium-99; TRU=transuranic; WM=Waste Management; WR=Water Resources; WTP=Waste Treatment Plant.

Table 4. Roadmap to the Tank Closure Alternatives *(continued)*

TANK CLOSURE ALTERNATIVE 3A: Existing WTP Vitrification with Thermal Supplemental Treatment (Bulk Vitrification); Landfill Closure									
STORAGE		**RETRIEVAL**		**TREATMENT**		**DISPOSAL**		**CLOSURE**	
Key Features • 4 waste receiver facilities • No new double-shell tanks		*Key Features* • 99 percent tank waste retrieval • Liquid-based retrieval technologies • Current leak detection technology • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank		*Key Features* • Waste treatment: 2018–2040 • 6 MTG/day (2 HLW melters) × 30 MTG/day (2 LAW melters) • Supplemental treatment (bulk vitrification) • No Tc-99 removal • No sulfate removal • Tank-derived TRU waste treatment		*Key Features* • ILAW disposal on site • IHLW storage includes CSB + 4 additional vaults		*Key Features* • Landfill closure (modified RCRA Subtitle C barrier) • Upper 4.6 meters (15 feet) of soil in BX and SX tank farms and ancillary equipment removed • 100-year postclosure care	
Potential Issues • Construction of 4 waste receiver facilities		*Potential Issues* • Retrieval leakage rate = 15,120 liters (4,000 gallons) per single-shell tank		*Potential Issues* • Construction in 200-East and 200-West Areas • Addition of bulk vitrification supplemental treatment capacity		*Potential Issues* • ILAW disposal on site • Tc-99 in ILAW and bulk vitrification • No waste acceptance criteria for HLW melters (stored indefinitely) • Tank-derived TRU waste disposal at WIPP		*Potential Issues* • Landfill closure of all single-shell tank farms with 1 percent residual waste and adjacent cribs and trenches (ditches) • Benefit of removing upper 4.6 meters (15 feet) of soil in BX and SX tank farms	
Description • 2.2.1 • 2.2.2.1 • 2.5.2.3.1 • D.1 • E.1	*Impacts* • 4.1.1.4 LR • 4.1.4.4 AQ • 4.1.10.4 NO • 4.1.11.4 FA	*Description* • 2.2.2.1 • 2.5.2.3.1 • D.1 • E.1	*Impacts* • 4.1.4.4 AQ • 4.1.6.4 WR • 4.1.9.4 S • 4.1.10.4 NO • 4.1.11.4 FA • 5.1.1.4 GW • 5.1.2.4 HH • 5.1.3.4 LER	*Description* • 2.2.2.2 • 2.5.2.3.1 • D.1 • E.1	*Impacts* • 4.1.1.4 LR • 4.1.4.4 AQ • 4.1.6.4 WR • 4.1.7.4 ER • 4.1.9.4 S • 4.1.10.4 NO • 4.1.11.4 FA • 4.11.14.4 WM • 5.1.1.4 GW • 5.1.2.4 HH • 5.1.3.4 LER	*Description* • 2.2.2.3 • 2.5.2.3.1 • D.1 • E.1	*Impacts* • 4.1.1.4 LR • 4.1.4.4 AQ • 4.1.6.4 WR • 4.1.7.4 ER • 4.1.11.4 FA • 4.1.12.4 T • 4.1.14.4 WM • 5.1.1.4 GW • 5.1.2.4 HH • 5.1.3.4 LER	*Description* • 2.2.2.4 • 2.5.2.3.1 • E.1	*Impacts* • 4.1.4.4 AQ • 4.1.6.4 WR • 4.1.10.4 NO • 4.1.14.4 WM • 5.1.1.4 GW • 5.1.2.4 HH • 5.1.3.4 LER

Note: "Key Features" include alternative configurations, treatment dates, and assumptions. "Potential Issues" include topics that may be environmental impact drivers or are expected to be of interest to readers. "Description" identifies EIS Chapter 2 and Appendix D and E sections that further describe the Key Features, including the technologies evaluated. Chapter 2 provides an overview of the alternatives, while Appendix E provides more-detailed information. "Impacts" identify EIS Chapter 4 and 5 sections that describe the impacts of the Key Features and/or Potential Issues.

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:	Docket No. 63-001-HLW
U.S. DEPARTMENT OF ENERGY	ASLBP No. 09-892-HLW-CAB04
(High-Level Waste Repository)	March 3, 2010

CERTIFICATE OF SERVICE

I hereby certify that copies of the State of Washington's Petition for Leave to Intervene and Request for Hearing and Affidavit of Suzanne L. Dahl-Crumpler in Support of State of Washington's Petition for Leave to Intervene dated March 3, 2010, have been served upon the following persons by Electronic Information Exchange.

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