



January 9, 2019

Via Electronic Mail

Ms. Theresa Kliczewski,
U.S. Department of Energy
Office of Environmental Management
Office of Waste and Materials Management (EM-4.2)
1000 Independence Avenue SW
Washington, D.C. 20585
Email: HLWnotice@em.doe.gov

RE: NRDC et al. Comments on Energy Department's Request for Public Comment on the Interpretation of High-Level Radioactive Waste

Dear Ms. Kliczewski:

The Natural Resources Defense Council ("NRDC"), Hanford Challenge ("HC"), Columbia Riverkeeper ("CRK"), Southwest Research & Information Center ("SRIC"), Snake River Alliance ("SRA"), Savannah River Site Watch ("SRS Watch"), Institute for Policy Studies

("IPS") and Nuclear Information & Resource Service ("NIRS") write today to comment on the Department of Energy's *Request for Public Comment on the U.S. Department of Energy Interpretation of High-Level Radioactive Waste*. 83 Fed. Reg. 50909, October 10, 2018 (hereinafter "HLW Reinterpretation Proposal") (comment deadline extended to this date (January 9, 2019), 83 Fed. Reg. 62569, December 4, 2018).

The high-level radioactive waste ("HLW") Reinterpretation Proposal, if implemented by the U.S. Department of Energy ("DOE") in a final form, would be contrary to law and create a host of technically unsound, indefensible, and dangerous situations in multiple locations around the country. Bluntly, finalizing this internal order would flatly violate the express directions of Congress found in the Nuclear Waste Policy Act ("NWPA"). Those harms will elicit legal challenges, but not just because the actions are contrary to law. The legal infirmity of DOE's HLW Reinterpretation Proposal is exponentially compounded by the practical, real-world harm of setting precedent that will allow the Trump Administration DOE—and future administrations—to abandon extraordinary amounts of the world's most toxic waste at nuclear weapons cleanup sites across the country. Locations as diverse as the leaking HLW tanks next to the Columbia River in Washington; the extraordinarily toxic HLW in two "tank farms" near the Savannah River between South Carolina and Georgia; and misguided expansions of the Waste Isolation Pilot Plant ("WIPP"), the troubled and controversial operating transuranic waste site near Carlsbad, New Mexico, are all areas that can and will be deeply harmed by DOE's HLW Reinterpretation Proposal. Each area would be the recipient of more improperly managed and abandoned radioactive waste, all without adequate protection from external regulatory oversight or, indeed, any meaningful environmental standards.

Further, the Trump Administration's HLW Reinterpretation Proposal is being done in parallel with DOE's effort to reclassify HLW and thereby abandon that waste via the "Waste Incidental to Reprocessing Determination" ("WIR") effort for 16 HLW tanks at Area C of the Hanford Nuclear Reservation in Washington.¹ We view these two DOE self-regulating draft orders as inextricably linked by their subject matter – *e.g.*, the Department of Energy assuming for itself the ability to "reclassify" or "reinterpret" HLW – and their potential impacts on the final decisions, precedents, and the ultimate legal obligations for DOE under the already inadequate existing framework of nuclear waste cleanup law.

Rather than continue a course that is sure to end up in litigation, as we identified in November 2018 with respect to the Draft WIR Determination, we urge you to withdraw this HLW Reinterpretation Proposal and commence working with the immediately affected States, Tribes, Congress and interested members of the public on reforms to nuclear waste law and putting the cleanup of the nuclear weapons complex on a course that is both scientifically defensible and publicly accepted.

¹ See, Exhibit 1, incorporated *en bloc* for this administrative record, NRDC, Hanford Challenge & Columbia Riverkeeper Comments on *Draft Waste Incidental to Reprocessing Evaluation for Closure of Waste Management Area C at the Hanford Site, Washington*, filed Nov. 7, 2018 (cited hereinafter as "Ex. 1 at ___").

I. Statements of Interest

NRDC is a national non-profit membership environmental organization with offices in Washington, D.C., New York City, San Francisco, Chicago, Los Angeles, and Beijing. NRDC has a nationwide membership of over one million combined members and activists. NRDC's activities include maintaining and enhancing environmental quality and monitoring federal agency actions to ensure that federal statutes enacted to protect human health and the environment are fully and properly implemented. Since its inception in 1970, NRDC has sought to improve the environmental, health, and safety conditions at the nuclear facilities operated by the U.S. Department of Energy ("DOE" or "Department") and its predecessor agencies, and we will continue to do so.

Hanford Challenge is a non-profit, public interest, environmental and worker advocacy organization located at 2719 East Madison Street, Suite 304, Seattle, WA 98112. Hanford Challenge is an independent 501(c)(3) membership organization incorporated in the State of Washington and dedicated to creating a future for Hanford that secures human health and safety, advances accountability, and promotes a sustainable environmental legacy. Hanford Challenge has members who work at the Hanford Site and within the Tank Farms who are at risk of imminent and substantial endangerment due to DOE's handling, storage, treatment, transportation, and disposal of Hanford's solid and hazardous waste. Other members of Hanford Challenge work and/or recreate near Hanford, where they may also be affected by hazardous materials emitted into the environment by Hanford. All members have a strong interest in ensuring the safe and effective cleanup of the nation's most toxic nuclear site for themselves and for current and future generations, and who are therefore affected by conditions that endanger human health and the environment.

Columbia Riverkeeper (CRK) is a 501(c)(3) nonprofit organization with a mission to protect and restore the Columbia River, from its headwaters to the Pacific Ocean. Since 1989, Riverkeeper and its predecessor organizations have played an active role in educating the public about Hanford, increasing public participation in cleanup decisions, and monitoring and improving cleanup activities at Hanford. Columbia Riverkeeper and its 13,000 members in Oregon and Washington have a strong interest in protecting the Columbia River, people, fish, and wildlife from contamination at Hanford, including pollution originating in Hanford's tank farms.

Southwest Research and Information Center (SRIC) is a 501(c)(3) nonprofit organization with a mission to promote the health of people and communities, protect natural resources, ensure citizen participation, and secure environmental and social justice now and for future generations. Founded in 1971, for more than forty years SRIC's board, staff, and supporters have worked to protect worker and public health and safety of WIPP, as well as technically sound, publicly accepted cleanup of DOE nuclear weapons sites.

The Snake River Alliance (Alliance) was founded in 1979, soon after the Three-Mile Island accident, by a handful of people who had just learned the Idaho National Laboratory routinely injected hazardous and radioactive waste into the Snake River Aquifer, the sole source of drinking water for a quarter of a million people. Ever since INL was named a Superfund site in

1989, the Alliance has been the most active advocate of cleanup there. The Alliance and its members work to protect Idaho's people, environment, and economy from nuclear weapons, power, and waste at the Idaho National Laboratory.

Savannah River Site Watch is a research and advocacy 501(c)(3) nonprofit organization that primarily focuses on the environmental and health impact of management of nuclear materials and of nuclear waste, including HLW in aging tanks, at DOE's Savannah River Site in South Carolina. SRS Watch endorses sound nuclear non-proliferation policies that preclude unnecessary import of highly radioactive foreign and domestic spent fuel and plutonium to SRS and that facilitate closure of the DOE's last remaining reprocessing plant, the 63-year-old H-Canyon.

Nuclear Information and Resource Service (NIRS) is a national non-profit 501(c)(3) organization devoted to a nuclear-free, carbon-free world. We have served as the information and networking hub for people and organizations concerned about nuclear power, radioactive waste, radiation, and sustainable energy issues since 1978. We work internationally to create a sustainable energy future without nuclear power and are affiliated with the World Information Service on Energy (WISE) International. We support a nuclear free, carbon free sustainable energy future, a democratically-based energy system in which communities are empowered to make decisions about their energy sources, environmental justice, just transitions that address the needs of communities during the progression from nuclear energy and fossil fuels to renewable energy and prevention of and protection from exposure to radiation.

Institute for Policy Studies is a progressive think tank dedicated to building a more equitable, ecologically sustainable, and peaceful society.

II. Summary Comments

The Trump Administration DOE has proposed to reinterpret the definition of HLW. This is not a bureaucratic exercise with minor, semantic impacts on obscure DOE operations. Rather, DOE proposes to fundamentally alter more than 50 years of national consensus on how the most toxic, radioactive, and dangerous waste in the world is managed and ultimately disposed in geologic repositories. The proposal, if implemented, would seriously endanger millions of Americans and countless future generations. Because HLW contains highly radioactive fission products and radionuclides that pose long-term dangers to human health and the environment, Congress has enacted laws defining HLW and defined DOE responsibilities to safely manage the waste at its sites and to dispose of that waste in geologic repositories. It has not given DOE authority to change the definition of HLW. The following comments describe the background and history of HLW, including legislation and litigation. We also provide specific comments on the basis and justification for the reinterpretation provided in the October 10, 2018 *Federal Register* notice.

III. Background and History on HLW

The DOE's attempt to assume for itself the ability to "reinterpret" HLW is, as an initial matter, one of statutory interpretation. It is axiomatic that "[t]he task of resolving [a] dispute over the

meaning of [a statute] begins where all such inquiries must begin: with the language of the statute itself.” *United States v. Ron Pair Enters, Inc.*, 489 U.S. 235, 241 (1989). Where statutory language inquiry reveals plain language, “the sole function of the courts is to enforce it according to its terms.” *Id.* (quoting *Caminetti v. United States*, 242 U.S. 470, 485 (1917)). A “[court] need not defer [to an agency if it] can ascertain congressional intent using the traditional tools of statutory construction.” *Ortiz v. Meissner*, 179 F.3d 718, 723 (9th Cir. 1999) (citing *INS v. Cardoza-Fonseca*, 480 U.S. 421, 446 (1987)); see also *California Energy Comm’n v. Bonneville Power Admin.*, 909 F.2d 1298, 1306 (9th Cir. 1990). The factual elements of this matter are technical in nature, but there is no genuine dispute about those elements.

HLW has been defined by Congress and this is binding on DOE.

A. The HLW Reinterpretation Proposal Violates the Plain Language of the Nuclear Waste Policy Act

The two-step framework articulated in *Chevron U.S.A., Inc. v. Natural Resources Defense Council, Inc.*, 467 U.S. 837, 842-843 (1984), requires that courts are “the final authority on issues of statutory construction and will reject administrative constructions which are contrary to clear congressional intent.”² “First, always, is the question whether Congress has directly spoken to the precise question at issue. If the intent of Congress is clear, that is the end of the matter”³ Second, if there is some question as to Congress’s intent, the agency’s interpretation must be “based on a permissible construction of the statute.”⁴

The legality of the Trump Administration DOE’s HLW Reinterpretation Proposal is a plain language matter—*Chevron* Step 1. Congress directly spoke to the issue and that should be the end of the matter.

1. Congress Plainly States that HLW is the Highly Radioactive Material Resulting from the Reprocessing of Spent Nuclear Fuel

Congress is clear. HLW by definition is:

(A) *the highly radioactive material resulting from the reprocessing of spent nuclear fuel*, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and

² *American Rivers v. Federal Energy Regulatory Comm’n*, 201 F.3d 1186, 1194 (9th Cir. 2000) (quoting *Natural Resources Defense Council, Inc. v. United States Dep’t of Interior*, 113 F.3d 1121, 1124 (9th Cir. 1997) (citing *Chevron*, 467 U.S. at 843 n.9) (internal quotations omitted)).

³ *American Rivers*, 201 F.3d at 1194 (quoting *Chevron*, 467 U.S. at 842-3); accord *Rainsong Co. v. Federal Energy Regulatory Comm’n*, 106 F.3d 269, 272 (9th Cir. 1997).

⁴ *Chevron*, 467 U.S. at 843.

(B) other highly radioactive material that the Commission [NRC], consistent with existing law, determines by rule requires permanent isolation.⁵

Thus, the NWPA defines HLW by its source – “the highly radioactive material resulting from the reprocessing of spent nuclear fuel” – rather than specifics of its hazardous characteristics. Reprocessing waste is categorically treated as HLW and defined by its origin because it is necessarily both “intensely radioactive and long-lived.”⁶ Reprocessing is the act of separating the ingredients in irradiated nuclear reactor fuel and target materials, including plutonium, into constituent parts or streams.⁷ The extraordinarily radioactive waste that results from this process is HLW.⁸

The language that follows the word “including” in subsection (A) in the HLW definition is there for illustrative purposes. Under traditional rules of statutory construction, the term “including” is not one of all-embracing definition, but connotes simply an illustrative application of the general principle.⁹ Congress’s general principle is that HLW is defined by its source. Therefore, Congress is clear that HLW is all highly radioactive material resulting from the reprocessing of spent nuclear fuel. Such reprocessing took place at Hanford, Idaho National Laboratory and the Savannah River Site and continues in the H-Canyon reprocessing plant at SRS.

In subsection (B) of the HLW definition, Congress provides the U.S. Nuclear Regulatory Commission (“NRC”) -- not DOE -- with the authority to determine via rulemaking that “other” highly radioactive material (*i.e.*, highly radioactive material that *may not be* the result of the reprocessing of spent nuclear fuel) requires permanent isolation (*i.e.*, should be disposed of in a repository pursuant to the NWPA). Subsection (B) of the HLW definition is not germane at this juncture as DOE is not subjecting its HLW Reinterpretation Proposal to the regulatory authority of the NRC.

⁵ 42 U.S.C. § 10101(12) (emphasis added). “Fission products” are radioactive elements. It should also be noted that the AEA has specifically adopted the definitions of “high-level radioactive waste” and “spent nuclear fuel” included in the NWPA. 42 U.S.C. § 2014(dd).

⁶ See 52 Fed. Reg. 5994. See also, Ex. 1, Att. C, where NRDC nuclear physicist Dr. Thomas Cochran describes both the nature of reprocessing and the resulting HLW. Cochran Decl. at 5-7.

⁷ *Id.*

⁸ *Id.*

⁹ *Public Citizen, Inc. v. Lew*, 127 F.Supp.2d 1 (D.D.C. 2000) (citing *Fed. Land Bank v. Bismarck Lumber Co.*, 314 U.S. 95, 100 (1941)). See also, *F.T.C. v. MTK Marketing, Inc.*, 149 F.3d 1036, 1040 (9th Cir. 1998), *cert. denied*, *Frontier Pacific Ins. Co. v. F.T.C.*, 119 S.Ct. 1028 (1999) (“In terms of statutory construction, use of the word ‘includes’ does not connote limitation; in definitive provisions of statutes and other writings, ‘include’ is frequently, if not generally, used as a word of extension or enlargement rather than as one of limitation or enumeration.”); and *U.S. v. Gertz*, 249 F.2d 662, 666 (9th Cir. 1957) (“The word ‘includes’ is generally a term of enlargement and not of limitation, and ‘including’ is not one of all embracing definition, but connotes an illustrative application of the general principle.) (citations omitted).

2. Congress Plainly States that HLW is to be Disposed of in a Deep, Geologic Repository Pursuant to the NWPA

The intent of Congress with respect to HLW is plain. HLW from the reprocessing of spent nuclear fuel is to be “disposed” of in a deep, geologic repository constructed and regulated pursuant to the NWPA.¹⁰

Congress also defined the term “disposal” in plain language: “[T]he emplacement *in a repository* of HLW, spent nuclear fuel, or other highly radioactive material *with no foreseeable intent of discovery...*”¹¹ In case there is any doubt, the NWPA’s legislative history displays Congress’s intent that HLW should be as isolated as possible from humans and their natural environment pursuant to the NWPA. Congress wrote:

The Committee strongly recommends that the focus of the Federal waste management program remain, as it is today, on the development of facilities for disposal of high-level nuclear waste *which do not rely on human monitoring and maintenance to keep the waste from entering the biosphere. As has been emphasized and reiterated over the lifetime of the federal nuclear program, high level wastes should not be a burden on future generations.*¹²

Efforts by DOE to claim for itself the ability to “reinterpret” this definition when Congress has already spoken to the issue are misplaced. The reason Congress has been so clear on this topic is that DOE and its predecessor agencies have generated some 100 million gallons of extraordinarily dangerous HLW, stored in tanks in Idaho, South Carolina, and Washington. Congress addressed this fact directly in the text of the NWPA.

In response to the massive amounts of HLW at defense facilities (and spent nuclear fuel at commercial facilities), Congress directed that HLW (and commercial spent fuel) be disposed of in a deep, geologic repository, constructed and regulated pursuant to the NWPA. 42 U.S.C. § 10101, *et seq.* As described above, the definition of HLW under the NWPA is plain (“the highly radioactive material resulting from the reprocessing of spent nuclear fuel”), and even contains two illustrations of HLW (“liquid waste produced directly in reprocessing” and “solid material derived from such waste with fission products in sufficient concentration”). In short, the waste in the tanks in Idaho, South Carolina, and Washington is defense-generated HLW, *i.e.*, highly radioactive material resulting from the reprocessing of spent nuclear fuel and is thus subject to the NWPA. Any new interpretation by DOE to arbitrarily reclassify the HLW in any of these places so that the agency may avoid compliance with the NWPA and abandon the waste in place under less protective standards or dispose of it other than in a geologic repository cannot stand under well-established tenets of statutory interpretation.

¹⁰ 42 U.S.C. § 10107(b)(2); *see also* August 2002 Decision at 11 (“Unless the President finds otherwise, defense high-level waste must be disposed of in civilian repositories established by the NWPA.”)

¹¹ 42 U.S.C. § 10101(9) (emphasis added); *see also* the discussion that follows of the decades of scientific agreement on the need to dispose of reprocessing waste in a geologic repository.

¹² H.R. Rep. No. 97-491, 97th Cong., 2d Sess at 29 (1982, emphasis added).

B. The Development of the HLW Definition & Why DOE Has No Authority to Rewrite the Law.

Over the decades, there has been as yet unresolved debate and conflict over where HLW and spent nuclear fuel should be disposed of and the process for arriving at both temporary management and final disposal options. However, there has been little dispute over the basic nature of HLW—the waste resulting from the reprocessing of spent nuclear fuel—and the fundamental conception that disposal should be in a deep geologic repository, as isolated from the human biosphere as possible.

1. The AEC Years

In a 1957 report, prepared at the request of the U.S. Atomic Energy Commission (“AEC”), the National Research Council of the U.S. National Academies “endorsed the concept of geological disposal—placing high-level waste (HLW) in a carefully selected deep underground formation, where it would remain isolated from human beings and the environment long enough for the radioactivity to decay to near natural background levels.”¹³ Notably, until the Trump Administration DOE’s latest attempt to rewrite the law with this HLW Reinterpretation Proposal, this 1957 technical observation has been the statutory baseline for federal and state governments, tribes, industry, and public interest groups. Parallel, but ultimately distinct from the long history of commercial spent nuclear fuel, the AEC first formally defined the term “high-level radioactive waste” in Appendix F to its reactor licensing rules in 1970,¹⁴ based on the waste’s origin rather than the hazard posed by its various components. The AEC wrote that high level radioactive waste means:

those aqueous wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuels.¹⁵

It was in 1972 that Congress first took up the term and set forth a definition, thereby superseding the agency’s statements. In the Marine Protection, Research, and Sanctuaries Act of 1972, which prohibited ocean dumping of HLW, Congress wrote a definition consistent with that of the AEC’s, but also included the spent fuel from commercial reactors. HLW was, at that time:

¹³ National Research Council, Disposition of High-Level Waste and Spent Fuel: The Continuing Societal and Technical Challenges, Washington, D.C.: National Academy Press, 2001, p. ix.

¹⁴ Policy Relating to the Siting of Fuel Reprocessing Plants and Related Waste Management Facilities, 35 Fed. Reg. 17530, 17532 (Nov. 14, 1970) (10 C.F.R. Part 50, App. F). Until this treatment, the AEC had informally defined high-level waste in terms of the hazard it posed. Office of Technology Assessment, Managing the Nation’s Commercial High-Level Radioactive Waste 204-205 (1985), available at http://govinfo.library.unt.edu/ota/Ota_4/DATA/1985/8514.PDF.

¹⁵ *Id.*

the aqueous waste resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated waste from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuels, or irradiated fuel from nuclear power reactors.¹⁶

The AEC was abolished with the Energy Reorganization Act of 1974, and Congress transferred all civilian regulatory responsibilities to the Nuclear Regulatory Commission (“NRC”) and nuclear weapons activities to the Energy Research and Development Administration (“ERDA”), which was replaced by DOE in 1977. The 1974 Act did not specifically authorize external regulation (by the NRC) of the weapons activities. It did, however, specifically authorize the NRC to license and regulate any “facilities authorized for the express purpose of subsequent long-term storage of high-level radioactive waste generated by the Administration...”¹⁷

2. The ERDA/DOE Years

The Energy Reorganization Act, focused on the transfer of power among newly created federal agencies, did not define “high-level radioactive waste.” The term was, however, interpreted to mean the same thing in the Energy Reorganization Act that it meant in the AEC’s Appendix F and the Marine Sanctuaries Act.¹⁸ ERDA plainly viewed the material stored in the tanks at Hanford and Savannah River to be high-level radioactive wastes.¹⁹ Those wastes in the tanks remained under the self-regulatory purview of the newly created DOE a few years after, even as it was becoming clear that the ambition of a safe and economically-viable closed fuel cycle would not come true and this waste would have to be prepared in some fashion for disposal in deep geologic repositories.

In managing the HLW in the tanks and with theoretically readying that waste for final disposal, DOE has kept the HLW in huge, underground interim storage tanks at SRS, INL and Hanford. Over the many decades of storage, hundreds of thousands of gallons of this waste has leaked into the environment, primarily at Hanford. Because this HLW contains highly corrosive components, organics, and heavy metals, it is also a mixed waste regulated under the Resource Conservation & Recovery Act (“RCRA”), 42 U.S.C. §§6901-6992k.

The affected public, States, Tribes and even the Trump Administration DOE would likely agree that management and (hopefully someday) disposal of the HLW tanks is one of DOE’s most difficult problems in addressing the environmental legacy of the Cold War. Various plans for tank waste management and disposal have been forwarded, acted upon, or discarded, including transferring pumpable liquids from single-shelled tanks to double-shelled tanks (at Hanford), heating the waste to convert it to a powdery form (called calcining at INL), and vitrifying the waste (a process that stabilizes radioactive waste by mixing it with molten glass) for disposal at a geologic repository pursuant to the NWPA (currently ongoing at the SRS’s Defense Waste

¹⁶ 33 U.S.C. 1402.

¹⁷ 42 U.S.C. 5842 (4).

¹⁸ 52 Fed. Reg. 5992, 5993 (Feb. 27, 1987).

¹⁹ *NRDC v. Administrator, ERDA*, 451 F. Supp. 1245, 1251 (D. D.C. 1978), *aff’d in part and rev’d in part, NRDC v. NRC*, 606 F.2d 1261 (D.C. Cir. 1979).

Processing Facility (“DWPF”) and in the process of being attempted at the Hanford site now for decades without success). At SRS, around 4200 large casks have been filled with vitrified waste in the DWPF, with DOE rightly asserting from the start of operation of that facility in 1996 that the casks were destined, as required by law, for disposal in a geologic facility. Since the passage of the NWPA in 1982 and a Presidential Directive issued pursuant to that Act in 1985, defense HLW has been required to be removed from these tanks and disposed of in a deep geologic repository pursuant to the requirements of the NWPA.²⁰

3. The Nuclear Waste Policy Act (NWPA)

As we noted above, Congress has summarily addressed this matter in the NWPA, but that definition of HLW was not drawn from a blank slate. The first draft of the definition of “high-level radioactive waste” used in the NWPA was initially modeled after the definition found in the West Valley Demonstration Project Act, but its evolution is worth noting. The West Valley Act definition, like the AEC’s original in 1970 and the first statutory definition that closely followed in 1972, defined the term as waste “produced by the reprocessing ... of spent nuclear fuel,” and included “both liquid wastes which are produced directly in reprocessing” and “dry solid material derived from such liquid waste.” The NWPA definition, however, also provides that the NRC may include “such other material” as may be necessary “for purposes of protecting the public health and safety.”²¹ Significantly, the West Valley Act gave the Commission the power to add material other than reprocessing wastes to the definition, but not to exempt any part of the reprocessing wastes from it. DOE objected to the definition and recommended that it be rewritten to “permit the regulatory agencies to exclude materials from ‘high-level radioactive waste’ that need not be disposed of in a repository because of low activity.”²² Congress rewrote that definition, but not as the Department asked. As enacted, the final definition provides that “high-level radioactive waste” means:

(A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and

(B) other highly radioactive material that the Commission, consistent with existing law, determines by rule requires permanent isolation.²³

²⁰ 42 U.S.C. § 10107(b)(2).

²¹ Public Law 96-368, sec. 6(4) (42 U.S.C. § 2021).

²² H. Rept. 97-491 (part 2) at 17 (1982) (letter from Eric Fygi to Chairman Price).

²³ 42 U.S.C. § 10101(12). The Price-Anderson Amendments Act of 1988, Public Law 100-408, later incorporated the Nuclear Waste Policy Act’s definition of “high-level radioactive waste” into the Atomic Energy Act of 1954 by reference. 42 U.S.C. § 2014(dd).

The NRC has interpreted subparagraph (A) as “essentially identical” to the Commission’s regulatory definition,²⁴ with one major difference. NRC’s definition includes “solids into which such liquid wastes have been converted.”²⁵ The NWPA’s definition states “solid material derived from such liquid waste *that contains fission products in sufficient concentrations.*”²⁶ NRC read the distinction to “reflect the possibility that liquid reprocessing wastes may be partitioned or otherwise treated so that some of the solidified products will contain substantially reduced concentrations of radionuclides.”²⁷

4. NRC’s Advance Notice of Proposed Rulemaking

In 1987, the NRC sought public comment on “whether the Commission should (1) numerically specify the concentrations of fission products which it would consider ‘sufficient’ to distinguish” high-level radioactive waste from non-high-level radioactive waste under subparagraph (A) of the statutory definition; or (2) define high-level radioactive waste “so as to equate” subparagraph (A) wastes “with those wastes which have traditionally been regarded as” high-level radioactive waste “under Appendix F ... and the Energy Reorganization Act.”²⁸ After some significant discussion of its authorities, vis-a-vis setting standards for what might constitute sufficient concentrations of HLW, NRC concluded “that the preferable construction” of the NWPA’s definition should “conform to the traditional definition” found in all the earlier iterations and 10 C.F.R. §60.2. What had been HLW remained HLW.²⁹

5. Reclassification of HLW and the Recent (Within Last Two Decades) History of HLW Litigation

After NRC’s effort at rulemaking—after some years in consultation and preparation and after the permanent abandonment of thousands of gallons of HLW in two tanks in South Carolina—DOE issued an internal rule, Order 435.1, on July 9, 1999. NRDC and the Snake River Alliance initially filed suit in the United States Court of Appeals for the 9th Circuit in January 2000 challenging one section of Order 435.1, the “waste incidental to reprocessing exemption” (“WIR” or “incidental waste exemption”). After finding that it lacked original or exclusive jurisdiction to entertain Plaintiffs’ claims under 42 U.S.C. § 10139, the 9th Circuit did not dismiss the case. Rather, the Court transferred the matter to the United States District Court for the District of Idaho, expressly leaving issues of standing, ripeness, and the merits to the District Court.³⁰

²⁴ See 52 Fed. Reg. at 5994. NRC’s HLW disposal rules, adopted before NWPA’s 1982 enactment, include: (1) irradiated reactor fuel; (2) liquid reprocessing wastes as defined in the AEC’s Appendix F; and (3) “solids into which such liquid wastes have been converted.” 10 C.F.R. § 60.2.

²⁵ 10 C.F.R. § 60.2.

²⁶ 42 U.S.C. § 10101(12)(A) (emphasis added).

²⁷ 52 Fed. Reg. at 5994.

²⁸ 52 Fed. Reg. at 5994.

²⁹ 53 Fed. Reg. 17709 (May 18, 1988).

³⁰ *Natural Resources Defense Council v. Abraham*, 244 F.3d 742, 747 (9th Cir. 2001).

After the transfer, NRDC *et al.* was joined by the Yakama Nation and Shoshone-Bannock Tribes. The combined set of plaintiffs filed a Complaint in February 2002. DOE filed an Answer in April 2002 and a Motion to Dismiss the Complaint in May 2002. At this point, the states of Washington, Idaho, South Carolina, and Oregon entered appearances as “*Amici Curiae*” in the proceeding. The District Court issued an opinion denying DOE’s Motion to Dismiss on August 9, 2002.³¹ The Court found that Plaintiffs had standing³² and that Order 435.1 was both final agency action and ripe for purposes of judicial review.³³ The District Court found that Plaintiffs had presented claims upon which relief could be granted and that the law of the case did not prevent consideration of those claims.³⁴ The District Court found that Order 435.1 and its accompanying Manual and Guidance necessarily implicate the disposal provisions of the NWPA by reclassifying HLW as low-level radioactive waste (“LLW”).³⁵ The Court also held that DOE does not operate with unfettered discretion with regard to the disposal of radioactive waste.³⁶

NRDC *et al.* and the George W. Bush Administration’s DOE then filed cross-motions for summary judgment. The District Court reaffirmed two earlier rulings: (1) its ripeness decision; and (2) its decision that DOE does not have discretion to dispose of defense HLW somewhere other than a repository established under the NWPA.³⁷ Specifically, the court found that the NWPA plainly required the Department to use the civilian repository for defense high-level radioactive waste once President Reagan decided that a separate repository was not required, and that the tank wastes at Hanford, Savannah River Site, and INL fall within the definition of high-level radioactive waste. The Department’s assertion that it can exempt waste streams based on technical and economic constraints, the court found, “directly conflicts with” the Act’s definition of high-level radioactive waste.³⁸ The District Court also found that Congress has spoken clearly on the subject and that DOE Order 435.1 directly conflicts with the NWPA’s definition of HLW (citing *Chevron v. NRDC*, 467 U.S. 837, 842 (1984)).³⁹ Accordingly, the District Court granted Plaintiffs’ Motion for Summary Judgment and denied DOE’s Cross-Motion for Summary Judgment.⁴⁰

Notably, the Court was clearly cognizant that we, NRDC in that instance, did not challenge the traditional notion of “incidental” waste materials contaminated during reprocessing operations that has long been recognized by the AEC and the NRC. The Court was also aware that at no point did we challenge the NRC’s authority to exempt solid materials derived from liquid reprocessing waste that contain sufficiently low concentrations of fission products to not require deep geologic disposal as provided by the NWPA. Judge Winmill held that the NWPA does not give the Department the authority to adopt an alternative disposal regime for high-level

³¹ *Natural Resources Defense Council v. Abraham*, 2002 U.S. Dist. LEXIS 28418 (D. Id. Aug. 9, 2002). *See* Ex. 1, Att. F for District Court opinion.

³² *Id.* at 20.

³³ *Id.* at 7-11.

³⁴ *Id.* at 15.

³⁵ *Id.* at 17.

³⁶ *Id.* at 19.

³⁷ ER 354-58; *see* published opinion, *NRDC v. Abraham*, 271 F.Supp.2d 1260, 1263-64 (D. Id. 2003).

³⁸ *Natural Resources Defense Council v. Abraham*, 271 F. Supp. 2d 1260 (D. Id. 2003).

³⁹ *Id.*

⁴⁰ *Id.* at 1263.

radioactive wastes merely because the Department decides “that it is too expensive or too difficult” to dispose of it in a deep geologic repository.⁴¹

DOE appealed the matter to the United States Court of Appeals for the 9th Circuit. The 9th Circuit subsequently found that the matter was not ripe for review.⁴² Importantly, the Ninth Circuit did not reach the merits of the Idaho Federal District Court's decision and put the legality of DOE's waste reclassification actions off for another day. Washington, South Carolina, and other States filed Amicus briefs in support of NRDC at both the District Court and appellate court stages.⁴³ The 9th Circuit avoided deciding the issue in 2004. It may not be able to do so if DOE finalizes its Area C Draft WIR Determination as it's currently written or if the agency moves forward with its proposed reinterpretation under discussion this day.

6. The Legislation that Emerged from the HLW Litigation – Section 3116

Contemporaneous with the Ninth Circuit's review of the Idaho Federal District Court's decision, the George W. Bush Administration DOE sought to have the District Court decision legislatively reversed by Congress. DOE succeeded in part, and failed in part, with this effort, titled Section 3116 of the *FY 2005 Defense Authorization Act*. See P.L. 108-375, *The Ronald Reagan National Defense Authorization Act of Fiscal Year 2005* (hereinafter “NDAA” and “Section 3116”). Senator Lindsey Graham (R-SC) was the primary proponent for Section 3116 and succeeded in inserting a provision into the 2005 Defense Authorization Act that substantially amends the NWPA.

Section 3116 spelled out criteria for the Energy Secretary to determine that the HLW can be reclassified as incidental waste (and thus can be disposed of on-site and in place) via amendments that provided DOE with authority to reclassify HLW as “waste incidental to reprocessing.” Therefore, under this law, DOE can dispose of this reclassified HLW according to requirements other than those specified by NWPA (*ie.*, the HLW will no longer have to be disposed of in a geologic repository and can be disposed of according to standards and performance objectives applicable to low-level radioactive waste (LLW)).

But the law restricted this activity to South Carolina and Idaho. The law states in pertinent part: “COVERED STATES—For purposes of this section, the following States are covered States: (1) The State of South Carolina. (2) The State of Idaho.” Section 3116(d)(1)(2). Thus, DOE was expressly barred by the terms of Section 3116 from reclassifying HLW in Washington and New York. Under those criteria, in SC and ID only, DOE may reclassify as “incidental” waste that exceeds the performance objectives for the disposal of low-level radioactive waste, 10 C.F.R. §61.40 (*ie.*, waste that is not actually low-level waste), so long as it has (1) removed highly radioactive radionuclides “to the maximum extent practical” and (2) has obtained a state issued permit, authority for the issuance of which is conferred on the State outside of Section 3116. At

⁴¹ *Id.* at 1265.

⁴² *NRDC v. Abraham*, 388 F.3d 701 (9th Cir. 2004).

⁴³ *Id.* at 707, 708, (“Despite NRDC's anxiety, the courts must await the coming of a proper time for decision, if, in the long run, that time ever comes. Maybe it never will come because DOE will not take actions that require—or even seem to require—court intervention. Who knows? In fine, the issue is not yet ripe.”).

SRS, pursuant to this authority, DOE “determined” that certain HLW in the underground tanks is “incidental” waste. 71 Fed. Reg. 3,838 (Jan. 24, 2006). As a practical matter, this means that DOE can undertake a process to reclassify HLW in South Carolina and Idaho. Conversely, DOE cannot reclassify the HLW that currently rests in the tanks at the Hanford site in Washington and in casks of vitrified waste at the West Valley site in New York.

As NRDC has repeatedly noted, this does not mean that DOE cannot remove waste from the tanks, treat it such that it no longer has fission products in sufficient concentration, and dispose of that waste in a manner other than in a geologic repository, after it has subjected that waste to approval by the NRC under its regulatory authority. What DOE cannot do in Washington or New York is declare the HLW in the tanks to be “waste incidental to reprocessing” or simply redefine or declare that HLW to be not HLW under no meaningful criteria. *See* 271 F.Supp.2d at 1265. Additional background is provided in the November 7, 2018 comments on pages 10-15.

7. The HLW Reinterpretation Proposal Would Allow DOE to Arbitrarily Reclassify HLW so that the Agency may Avoid Compliance with the NWPA

The Proposed Reinterpretation of HLW flies in the face of the plainly stated Congressional language and the clear explication of its terms by the Federal District Court in Idaho, a substantive decision that was far from explicitly reversed by the 9th Circuit Court's ripeness decision. It is worth reminding DOE of that decision at length. First, the Court noted the clear purpose of the WIR process. The Court wrote that “[t]he DOE issued Order 435.1 to govern reclassification of that waste. That Order, according to DOE, sets forth three criteria, “each of which must be met,” to reclassify HLW as low-level waste.” The same situation is at issue in the HLW Reinterpretation Proposal.

The District Court then went on to explain one of the deep legal infirmities in DOE's actions precisely relevant to the HLW Reinterpretation Proposal. The Court held,

This rigorous process, DOE implies, will protect against arbitrary action. However, one of those “three criteria” is not a benchmark that could be “met.” It requires that HLW reclassified as low-level waste must meet “safety requirements comparable to the performance objectives set out in 10 C.F.R. 61, Subpart C” In other words, DOE will treat waste that it deems to be low-level waste as low-level waste. This is not a “third criteria” that must be “met” but is simply a statement of intent or fact.⁴⁴

The same situation is presented in the HLW Reinterpretation Proposal. DOE will have the ability to claim and treat waste that it deems to be low-level waste as low-level waste. And while DOE tries to defensively gird the process with an inadequate Performance Assessment such as that put forward by the agency for the 16 Area C tanks at the Hanford site, the weaknesses of which are identified at length in the State of Washington Comments, and in our own technical evaluation,⁴⁵

⁴⁴ 271 F.Supp.2d at 1265.

⁴⁵ Ex. 1, Att. A, Declaration of Dr. Marco Kaltofen, *passim*.

there is no hiding the fact that there is no meaningful criteria in play here. Rather, DOE has simply made a statement of intent that it will treat HLW as LLW and dispose of it in a way that is plainly contrary to law.

More than a decade ago the Idaho Federal District Court left no room for DOE to wiggle out from under the clear directions of Congress, and its same cautions are precisely relevant to the HLW Reinterpretation Proposal and the parallel Area C Draft WIR Determination. The Court continued explaining Order 435.1, piece by piece, and further held:

There are really only two criteria that must be met. The first is that key radionuclides are removed to the extent technically and economically practical. This means that if DOE determines that it is too expensive or too difficult to treat HLW, DOE is free to reclassify it as incidental waste. The second is that HLW incorporated into a solid form must either meet the concentration levels for Class C low-level waste or meet such alternative requirements for waste classification and characterization as DOE may authorize. These “alternative requirements, are not defined, and thus are subject to the whim of DOE. While DOE has the authority to “fill any gap left ... by Congress,” *Chevron*, 467 U.S. at 843, it does not have the authority “to adopt a policy that directly conflicts with its governing statute.” *Maislin Indus., Inc. v. Primary Steel, Inc.*, 497 U.S. 116, 134-35 (1990).⁴⁶

Thus, the Court found that “DOE's Order 435.1 directly conflicts with NWPA's definition of HLW. NWPA's definition pays no heed to technical or economic constraints in waste treatment. Moreover, NWPA does not delegate to DOE the authority to establish alternative requirements” for solid waste. Because Congress has spoken clearly on that subject, “that is the end of the matter,” *Chevron*, 467 U.S. at 842, leaving no room for “alternative requirements.” Thus, DOE's Order 435.1 must be declared invalid under *Chevron*.⁴⁷ The HLW Reinterpretation Proposal, just as the District Court found with the original Order 435.1, runs directly counter to Congress's clear directions that HLW be disposed of in a repository. Moreover, the ripeness concerns that drove the 9th Circuit's procedural reversal are clearly done away with by the explicit terms of the Draft WIR Determination and the HLW Reinterpretation Proposal.

8. The Solids and Sludges Abandoned in HLW Tanks are HLW and, in Any Event, Contain Fission Materials in Sufficient Concentration

Assuming *arguendo* that the language of the NWPA is unclear—which it is not—the second illustrative clause in the definition of HLW (“any solid material derived from such liquid waste that contains fission products in sufficient concentrations”) provides no justification for an

⁴⁶ *Id.* at 1265, 1266; In the context of the Area C Draft WIR Determination, DOE attempts to blunt some of the force of this disapproving judicial opinion by suggesting that “[t]his provision in DOE 435.1 also includes the following language: “or will meet alternative requirements for waste classification and characterization as DOE may authorize.” DOE is not using or relying upon this language in this Draft WIR Evaluation to any degree whatsoever.” Draft WIR Determination at 1-4, n.7. As the entirety of the Idaho decision makes clear, such lack of reliance on the “alternative requirements” clause is unavailing.

⁴⁷ 271 F.Supp.2d at 1266.

arbitrary reinterpretation of a term defined by statute. An implication of this clause—that there is solid material derived from liquid reprocessing waste that does not contain fission products in sufficient concentrations to be HLW—has no application to the waste DOE may attempt to abandon at the bottom of the HLW tanks, or simply dilute with loads of concrete and grout and send to another shallow, land based repository that is wholly unsuited as an option for the disposal of nuclear waste.

Any attempt to reclassify/rename/reinterpret the HLW sediments and solids to be abandoned in the tanks as being “derived from” liquid reprocessing waste rather than “the highly radioactive material resulting from the reprocessing of spent nuclear fuel” would be incorrect. At Hanford, for example, DOE has acknowledged the range of HLW—and that range includes solids as well as liquids (and slurry and sludge).⁴⁸ In this context, “derived from” necessarily entails additional treatment of the reprocessing waste to reduce its volume or radioactivity or to convert it into a solid form.⁴⁹

And even if the waste was derived solid material—which it is not—it contains fission products in sufficient concentration. The HLW abandoned in the tanks is at least as radioactive (and perhaps more so) than the HLW removed from the tanks for disposal in a geologic repository.⁵⁰ Nor can DOE assume that there was up to 100-fold “dilution” of the waste by the added grout for the purposes of regulatory compliance.⁵¹ Thus, DOE's interpretation of the NWPA is entitled to no deference since the incidental waste exemption is neither reasonable nor consistent with the statutory purpose of isolating HLW.⁵²

DOE is, once again, via the HLW Reinterpretation Proposal, ignoring the definition of HLW of the NWPA to serve its purposes. First and most important, the incidental waste exemption runs directly counter to clear congressional direction that HLW be disposed of in a deep, geologic repository. The intent of Congress is clear and that should be the end of the matter. Second, assuming *arguendo*, even if Congress was silent or ambiguous on the subject of HLW disposal, DOE's action here today runs afoul of the NWPA by ignoring the basic inconsistency of treating as low-level waste the reprocessing waste that is at least as radioactive as waste removed for geologic disposal.

⁴⁸ See Tank Waste Remediation System, Hanford Site, Final Environmental Impact Statement, Volume Two, Appendix A, at A-12. (August 1996).

⁴⁹ See *e.g.*, 52 Fed. Reg. 5993-5998.

⁵⁰ See Ex. 1, Att. E, Complaint, at 8 (NRC Review of SRS HLW Tank Closure Methodology, June 30, 2000), where the NRC states that key radionuclides cannot be removed preferentially from the bottom of the tanks.

⁵¹ See Ex. 1, Att. C, Cochran Decl. at 9. Even when assuming a 100-fold dilution or averaging of the radioactivity of the abandoned waste with the near zero radioactivity of the grout at the SRS tanks, 37 of the 51 tanks would still be more radioactive than the low-level waste standards of 10 C.F.R. § 61.55. It should also be noted that this mathematical averaging takes place even if there is no significant physical mixing of the grout and HLW (note that if DOE could mix the solids and grout, it could readily remove the HLW). See Complaint Att. 19, Defense Nuclear Facilities Safety Board (“DNFSB”), SRS Report for Week Ending March 14, 1997 (1997) where the DNFSB expressed doubt about the effective mixing of the residual HLW sludge with the grout.

⁵² *Reilly*, 976 F.2d at 40.

Such actions cannot stand. Exemptions from “. . . humanitarian and remedial legislation [must] . . . be narrowly construed, giving due regard to the plain meaning of statutory language and the intent of Congress. To extend an exemption to other than those *plainly and unmistakably* within its terms and spirit is to abuse the interpretative process.”⁵³ The NWPA's authority over the requirements for environmentally sound and publicly accepted disposal of radioactive waste make it just such a “humanitarian and remedial” statute; thus, exemptions to it must be “narrowly construed.”⁵⁴

This HLW Reinterpretation Proposal is another step, along with allowing for the Area C WIR Determination and other reclassification decisions, to create a broad, ill-defined loophole under the NWPA that fatally undermines the purpose and intent of Congress to ensure that the highly radioactive material resulting from the reprocessing of spent nuclear fuel is disposed of in a manner protective of the environment and public health.

C. Congress has Determined that WIPP Cannot be the Geologic Repository for Any HLW.

DOE's HLW Reinterpretation Proposal also seems to be aimed at opening the door for disposal of HLW at the Waste Isolation Pilot Project (WIPP) site in New Mexico. Since WIPP's original authorization in 1979 in Public Law 96-164, Section 213, Congress, the State of New Mexico, and the public have understood that WIPP has a limited mission and that other nuclear waste disposal sites would be created. While the Department of Energy (DOE) has proposed that WIPP could have broader missions, the WIPP Land Withdrawal Act (LWA, Public Law 102-579, as amended) limited the mission to defense transuranic (TRU) waste with a capacity of up to 6.2 million cubic feet/175,564 cubic meters.⁵⁵ Section 12 of the LWA explicitly prohibits any HLW or spent fuel from being transported to, and stored and disposed at WIPP. The LWA also provides regulatory authorities to the State of New Mexico, including to issue a WIPP Permit under the Resource Conservation and Recovery Act. In October 2004, in response to a DOE proposal to rename some Hanford HLW to TRU, the WIPP Permit was modified to specifically exclude any waste from the 243 tanks at Hanford, INL, and SRS that had been managed as HLW.⁵⁶ Thus, it is undisputed that Congress has limited WIPP's mission to preclude any HLW disposal, and the State of New Mexico has further acted to prevent any HLW from Hanford, INL, SRS, and West Valley tanks through its WIPP Permit.

1. Brief Historical Background

In 1972, the Atomic Energy Commission (AEC) announced that it would operate WIPP as the nation's first geologic repository. By 1975, the AEC determined that WIPP would be for disposal of transuranic (TRU) waste only, but with a research-and-development capability for

⁵³ *A.H. Phillips, Inc. v. Walling*, 324 U.S. 490, 493 (1945)) (emphasis added).

⁵⁴ *Id.*

⁵⁵ Section 7(a)(3).

⁵⁶ New Mexico Environment Department, *Final Determination, Class 2 Modification Request*, October 29, 2004. <https://www.env.nm.gov/wipp/finaldet1104.pdf>. West Valley tank waste is excluded from WIPP as commercial waste.

experimentation for HLW in salt. In 1978, a DOE task force suggested that WIPP include a demonstration of retrievably storing up to 1,000 spent-fuel assemblies. Also in 1978, James Schlesinger, the first DOE Secretary, promised that New Mexico could veto WIPP. In April 1979, DOE issued a draft environmental impact statement with a “reference case” of WIPP as a licensed TRU repository; a research and development area for experiments with all types of nuclear waste, including HLW; and an “intermediate-scale facility” (ISF) for the permanent disposal of 1,000 commercial spent fuel assemblies.⁵⁷

In December 1979, Congress passed Public Law 96-164, Section 213, which authorized WIPP “to demonstrate the safe disposal of radioactive waste resulting from the defense activities and programs of the United States exempted from regulation by the Nuclear Regulatory Commission.” The law specifically designates WIPP as a “pilot plant,” and to “demonstrate the safe disposal.” Both of those designations clearly indicate that WIPP was not the sole disposal site for all TRU waste, and that HLW disposal was precluded because such disposal facilities were licensed by the NRC. Congress has maintained those legal requirements and constraints for the last 39 years. Additionally, Congress has not changed the authorization in subsequent nuclear waste laws.

In 1982, Congress passed the Nuclear Waste Policy Act (NWPA) (Public Law 97-425),

“An Act to provide for the development of repositories for the disposal of high-level radioactive waste and spent nuclear fuel, to establish a program of research, development, and demonstration regarding the disposal of high-level radioactive waste and spent nuclear fuel, and for other purposes.” Enactment heading.

The NWPA did not include WIPP, because the facility was authorized to be exempt from Nuclear Regulatory Commission (NRC) licensing, and disposal was limited to transuranic waste, while any repository for high-level defense waste would be licensed by the NRC. 42 U.S.C. 10107, Section 8(b)(3).

In 1987, Congress amended the NWPA to designate a single high-level waste and spent fuel repository, and discussed whether that facility should be WIPP, but again determined that WIPP would not be that facility, and instead designated Yucca Mountain, Nevada, as the repository. 42 U.S.C. 10172.

2. WIPP Land Withdrawal Act (LWA) - Public Law 102-579

Because DOE wanted to open the facility in 1988, WIPP land withdrawal bills were introduced in Congress, starting in 1987. The various bills were subject to congressional hearings and debate in Washington, DC and New Mexico. The requirements that WIPP would meet before receiving wastes, the capacity of the facility, whether any HLW was allowed, and the state and federal regulatory and oversight authorities were major issues in five years of debate leading to passage

⁵⁷ DOE. *Draft Environmental Impact Statement Waste Isolation Pilot Plant*, DOE/EIS-0026-D, April 1979, Vol. 1 at 2-18 and 19.

of the LWA by the House of Representatives on October 5, 1992 and the Senate on October 8, 1992.

The LWA clearly states:

“BAN ON HIGH-LEVEL RADIOACTIVE WASTE AND SPENT NUCLEAR FUEL.—The Secretary [of Energy] shall not transport high-level radioactive waste or spent nuclear fuel to WIPP or emplace or dispose of such waste or fuel at WIPP.”
Section 12.

Thus, Congress emphatically stated that no HLW could come to WIPP. That provision of the LWA remains unchanged today.

On November 26, 2003, the New Mexico Environment Department (NMED) issued an agency-initiated permit modification because

“NMED has reason to believe that the inventory of waste may be expanded to include waste streams that were not considered eligible for disposal at WIPP at the time the WIPP permit application was submitted, such as waste from HLW tanks at the Hanford, INEEL, and the Savannah River Site that DOE may declare as waste incidental to reprocessing.”⁵⁸

That modification was eventually withdrawn, as DOE agreed to submit its own modification request, which was done on July 2, 2004. That modification request proposed that any waste “from tanks that has ever been managed as high-level waste is not acceptable at WIPP unless specifically approved through a subsequent Class 3 permit modification.” On October 29, 2004, NMED approved the request with changes that incorporated a new Permit Condition II.C.3.i:

Excluded Waste TRU mixed waste that has ever been managed as high-level waste and waste from tanks specified in Permit Attachment B are not acceptable at WIPP unless specifically approved through a Class 3 permit modification. Such wastes are listed in Table II.C.3.i below. Table II.C.3.i - Additional Approved Waste Streams Date Class 3 Permit Modification Request Approved Description of Waste Stream.

In addition, a new Table B-9 was incorporated into the Permit that lists 177 Hanford tanks, 51 SRS tanks, and 15 INL tanks that are subject to the Excluded Waste Provision.

The Excluded Waste provision remains in the current WIPP Permit as Section 2.3.3.8 and Waste Tanks Subject to Exclusion is Table C-4.

⁵⁸ Fact Sheet, November 26, 2003 at 4. https://www.env.nm.gov/wipp/TWBIR_Fact_Sheet.pdf

Thus, the State of New Mexico has used its statutory authority to prohibit HLW wastes from WIPP, regardless of whether DOE reinterprets its HLW definition.

Therefore, DOE must recognize in the context of the HLW Reinterpretation Proposal and otherwise, that it cannot consider WIPP for disposal of any of this waste because it is contrary to law and to the New Mexico WIPP permit.

D. The Proposed Reinterpretation of HLW Reverses Nearly a Half Century of Waste Designation

It is a well-settled principle that an agency may not shift its position without supplying a reasoned explanation for doing so.⁵⁹ Since just after the Manhattan Project, the reprocessing waste disposed of in the tanks in Washington, South Carolina, Idaho and New York has been understood to be HLW. Indeed, DOE has spent decades analyzing and managing the HLW in the tanks, as evidenced by publications such as the *SRS High-Level Waste Tank Closure Draft Environmental Impact Statement* (November 2000).⁶⁰ And in the early 2000s, when the first iteration of this contentious dispute was fought, Congress explicitly passed on giving to DOE the power of reclassification of Washington and New York's HLW, and only allowed Idaho and South Carolina a process limited by Section 3116 of the National Defense Authorization Act of 2005.⁶¹

Literally thousands of documents have been developed and perhaps millions of pages have been written about how to manage and dispose of HLW tanks. Now, for the sake of expediency and without technical or legal support, DOE has issued this HLW Reinterpretation Proposal in hopes of providing for itself the authority to define away its most difficult and expensive cleanup problem. No bright line standards or intelligible criteria whatsoever allow DOE's discretion to reclassify what has been, until now, universally accepted as HLW destined for a geologic repository. The failure to provide any legally adequate explanation for this reversal of position is arbitrary and capricious and in violation of the law.⁶²

For the reasons articulated above, DOE should withdraw the Proposed Reinterpretation of HLW and commence working with the immediately affected States, Tribes, and interested members of the public on a cleanup trajectory for the high-level radioactive wastes (HLW) that is both scientifically defensible and publicly accepted.

IV. Specific Comments

1. DOE writes:

⁵⁹ *National Coalition Against the Misuse of Pesticides v. Thomas*, 809 F.2d 875, 883 (D.C. Cir. 1987); see also *State Farm*, 463 U.S. at 57.

⁶⁰ See Tank Waste Remediation System, Hanford Site, Final Environmental Impact Statement (August 1996).

⁶¹ NRDC *et al.* have compiled a select bibliography of sources of information on HLW, attached as Ex. 2.

⁶² *State Farm*, 463 U.S. at 57.

DOE manages large inventories of legacy waste resulting from spent nuclear fuel (SNF) reprocessing activities from atomic energy defense programs, e.g., nuclear weapons production. DOE also manages a small quantity of vitrified waste from a demonstration of commercial SNF reprocessing. Reprocessing generally refers to the dissolution of irradiated SNF in acid, generating liquid or viscous wastes, and the chemical processing to separate the fission products or transuranic elements of the SNF from the desired elements of plutonium and uranium, which are recovered for reuse. HLW Reinterpretation Proposal at 50909, c. 3 – 50910, c. 1.

Comments:

As described above, HLW is the result of the reprocessing of spent nuclear fuel. Congress has defined the term “HLW” and even the required conditions of “disposal” that are to be the end result. High-level nuclear wastes remain dangerous to humans for long periods of time. The D.C. Circuit observed: “[h]aving the capacity to outlast human civilization as we know it and the potential to devastate public health and the environment, nuclear waste has vexed scientists, Congress, and regulatory agencies for the last half-century.” *NEI et al.* at 1257. Because of this danger, since the National Academy of Sciences’ original recommendations in 1957,⁶³ it has been a nearly consensus view among government, industry and environmental stakeholders that the waste from the nation’s nuclear weapons program and its commercial nuclear power plants must be buried in technically sound deep geologic repositories, permanently isolated from the human and natural environments. This principle was codified as national policy nearly 30 years ago in the Nuclear Waste Policy Act (NWPA), 42 U.S.C. § 10131(b)(1) and reiterated in President Obama’s “*Blue Ribbon Commission on America’s Nuclear Future – Report to the Secretary of Energy, January 31, 2012*”.

2. DOE writes:

Liquid reprocessing wastes have been or are currently stored in large underground tanks at three DOE sites: Savannah River Site (SRS) (South Carolina), Idaho National Laboratory (INL) (Idaho), and the Office of River Protection at the Hanford Site (Washington). Solid reprocessing wastes are liquid wastes that have been immobilized in solid form and are currently stored at SRS, INL, and the West Valley Demonstration Project (New York). At 50910, c. 1

Comments:

We agree with these factual statements, though the description does not include the dangers posed by the wastes, nor the facts about the significant leaks that have occurred, especially at Hanford. See Ex 1, at 5.

3. DOE writes:

DOE’s interpretation of HLW is that reprocessing waste is non-HLW if the waste:

⁶³ National Academy of Sciences, *The Disposal of Radioactive Waste on Land, Report of the Committee on Waste Disposal of the Division of Earth Sciences* (Washington, D.C. 1957).

- I. *Does not exceed concentration limits for Class C low-level radioactive waste as set out in section 61.55 of title 10, Code of Federal Regulations; or*
- II. *Does not require disposal in a deep geologic repository and meets the performance objectives of a disposal facility as demonstrated through a performance assessment conducted in accordance with applicable regulatory requirements.*

Under DOE's interpretation, waste meeting either of these criteria is non-HLW and may be classified and disposed of in accordance with its radiological characteristics. Ibid.

Comments:

As we explained in detail above, the Trump Administration DOE has no basis under the law to reinterpret or redefine a term clearly defined under statute. DOE's interpretation misstates the relevant law, inaccurately describes the clear intent of Congress, and suggests a regulatory control and oversight process that is functionally non-existent. There is no legal basis for DOE's proposed term of "non-HLW."

First, as a straightforward matter of statutory interpretation, the NWPA defines HLW by its source – "the highly radioactive material resulting from the reprocessing of spent nuclear fuel" – rather than its hazardous characteristics. Reprocessing waste is categorically treated as HLW and defined by its origin as it is necessarily both "intensely radioactive and long-lived."⁶⁴ Reprocessing is the act of separating the ingredients in irradiated nuclear reactor fuel and target materials into constituent parts or streams.⁶⁵ The extraordinarily radioactive waste that results from this process is HLW.⁶⁶

The language that follows the word "including" in subsection (A) in the HLW definition is there for illustrative purposes. Under traditional rules of statutory construction, the term "including" is not one of all-embracing definition, but connotes simply an illustrative application of the general principle.⁶⁷ Congress's general principle is that HLW is defined by its source. Therefore, Congress is clear that HLW is all highly radioactive material resulting from the reprocessing of spent nuclear fuel.

⁶⁴ See 52 Fed. Reg. 5994. For purposes of explanation, Dr. Cochran describes both the nature of reprocessing and the resulting HLW. See also, Ex. 1, Att. C, at 5-7.

⁶⁵ *Id.*

⁶⁶ *Id.*

⁶⁷ *Public Citizen, Inc. v. Lew*, 127 F.Supp.2d 1 (D.D.C. 2000) (citing *Fed. Land Bank v. Bismarck Lumber Co.*, 314 U.S. 95, 100 (1941)). See also, *F.T.C. v. MTK Marketing, Inc.*, 149 F.3d 1036, 1040 (9th Cir. 1998), *cert. denied*, *Frontier Pacific Ins. Co. v. F.T.C.*, 119 S.Ct. 1028 (1999) ("In terms of statutory construction, use of the word 'includes' does not connote limitation; in definitive provisions of statutes and other writings, 'include' is frequently, if not generally, used as a word of extension or enlargement rather than as one of limitation or enumeration."); and *U.S. v. Gertz*, 249 F.2d 662, 666 (9th Cir. 1957) ("The word 'includes' is generally a term of enlargement and not of limitation, and 'including' is not one of all embracing definition, but connotes an illustrative application of the general principle.) (citations omitted).

In subsection (B) of the HLW definition, Congress provides the NRC (not DOE) with the authority to determine via rulemaking that “other” highly radioactive material (*i.e.*, highly radioactive material that *may not be* the result of the reprocessing of spent nuclear fuel) requires permanent isolation (*i.e.*, should be disposed of in a repository pursuant to the NWPA). Subsection (B) of the HLW definition is not germane at this juncture as DOE is not subjecting its HLW Reinterpretation Proposal to the regulatory authority of the NRC.

Second, DOE's suggestions that HLW that either “does not exceed concentration limits for Class C low-level radioactive waste” or “[d]oes not require disposal in a deep geologic repository and meets the performance objectives of a disposal facility as demonstrated through a performance assessment conducted in accordance with applicable regulatory requirements” flatly violate the law. In the first criteria – HLW that does not exceed the concentration limits for Class C, DOE could simply average the HLW at the bottom of a tank in any of the HLW sites and thereby suggest that the HLW is magically no longer HLW. The Idaho Federal District Court refused DOE on this ground in 2004 and such a suggestion is sure to elicit legal challenge.

To adopt DOE's second criteria—simply stating that the HLW does not require disposal in a deep geologic repository—would violate Congress's explicit instructions that HLW is to be disposed of in just such a repository. Further, for all intents and purposes, DOE is self-regulating with respect to its *management* of nuclear waste and thus we have no idea which or whose applicable regulatory requirements DOE refers to here. What are the regulatory standards for the stated Performance Assessment? Again, who is the applicable regulator? Is it a state? The NRC? Someone else? And under what statute and protective regulatory scheme will the waste formerly known as HLW be disposed of? The Trump Administration explains none of this.

4. DOE writes:

At this time, DOE is not making—and has not made—any decisions on the disposal of any particular waste stream. Disposal decisions, when made, will be based on the consideration of public comments in response to this Notice and prior input and consultation with appropriate state and local regulators and stakeholders. DOE will continue its current practice of managing all its reprocessing wastes as if they were HLW unless and until a specific waste is determined to be another category of waste based on detailed technical assessments of its characteristics and an evaluation of potential disposal pathways. Ibid.

Comments:

As evidenced by the Draft WIR Determination for the Area C Tanks at the Hanford site, DOE has, in fact, already made decisions about the disposal and classification of particular HLW streams. That determination serves notice that DOE will depart from its current practice of managing all its reprocessing wastes as if they were HLW and do so in a manner that violates the law. *Cf. Ex. 1, passim.*

At SRS, it is clear that the intent of DOE may already be to apply the new definition of HLW in order to reduce costs and speed disposal of HLW at SRS. In a January 23, 2018

recommendation to DOE entitled “Investigate Feasibility of Reclassifying Certain High-Level Waste to Enable Acceleration of Disposal and Reduction of Costs,”⁶⁸ the SRS Citizens Advisory Board (SRS CAB) recommended “that DOE investigate the feasibility of reclassifying the used DWPF melters and some portion of HLW canisters as TRU waste or LLW to expedite disposal, reduce costs, and to free-up storage space in the temporary GWSBs [Glass Waste Storage Buildings].”

In a July 30, 2018 response to the SRS CAB,⁶⁹ DOE accepted the recommendation and stated “DOE-SRS accepts this recommendation. At the DOE-headquarters level, consideration is being given to a potential revision to DOE Order 435.1, *Radioactive Waste Management*, that would enhance the risk-based components of the current definition of ‘high-level radioactive waste.’ A more risk-based approach could potentially provide more cost-effective and timely alternatives to the current disposal path for the items identified in your recommendation.” DOE’s response letter fails to point out that HLW is required by law to be disposed of in a geologic repository. Likewise, DOE is unable in the response letter to make the claim that Congress has altered the definition of HLW.

5. DOE writes:

DOE interprets the term “high-level radioactive waste”, as stated in the Atomic Energy Act of 1954 as amended (AEA),¹ and the Nuclear Waste Policy Act of 1982 as amended (NWP) in a manner that defines DOE reprocessing wastes to be classified as either HLW or non-HLW based on the radiological characteristics of the waste and their ability to meet appropriate disposal facility requirements. [Note 1 states: 42 U.S.C. 2011 et seq. This definition of HLW as first enacted in the Nuclear Waste Policy Act of 1982, as amended, and incorporated into the AEA in 1988.]

The basis for DOE’s interpretation comes from the AEA and NWP definition of HLW: “(A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and (B) other highly radioactive material that the Commission, consistent with existing law, determines by rule requires permanent isolation.”

In paragraph A, Congress limited HLW to those materials that are both “highly radioactive” and “resulting from the reprocessing of spent nuclear fuel.” Reprocessing generates liquid

⁶⁸ Savannah River Site Citizens Advisory Board recommendation Number 354 to DOE “Investigate Feasibility of Reclassifying Certain High-Level Waste to Enable Acceleration of Disposal and Reduction of Costs,” January 23, 2018,

https://www.srs.gov/general/outreach/srs-cab/library/recommendations/Rec_354_-_Reclassify_High-Level_Waste.pdf

⁶⁹ U.S. Department of Energy response to SRS Citizens Advisory Board Recommendation Number 354 to DOE “Investigate Feasibility of Reclassifying Certain High-Level Waste to Enable Acceleration of Disposal and Reduction of Costs,” July 30, 2018, https://www.srs.gov/general/outreach/srs-cab/library/responses/DOE_Response_to_CAB_Rec_354.pdf. (Website accessed January 9, 2019).

wastes, with the first cycle of reprocessing operations containing the majority of the fission products and transuranic elements removed from the SNF. Thus, in paragraph A, Congress distinguished HLW with regard to its form as both "liquid waste produced directly in reprocessing" and "any solid material derived from such liquid waste that contains fission products in sufficient concentrations." Id. c.1 & 2.

Comments:

DOE misstates the law. Congress did not limit HLW to "both" the result of reprocessing and constituents that are highly radioactive. The word "both" is not in the text of the definition, no matter how much DOE might wish it were or try to insert it via this misplaced HLW Reinterpretation Proposal. Rather, Congress wrote that HLW is "the highly radioactive material resulting from the reprocessing of spent nuclear fuel," and we addressed this in detail above. *Supra* at 4-7.

6. DOE writes:

In paragraph B, Congress defined HLW also to include "other highly radioactive material" that the Nuclear Regulatory Commission (NRC) determines by rule "requires permanent isolation." HLW under paragraph B includes highly radioactive material regardless of whether the waste is from reprocessing or some other activity. Further, under paragraph B, classification of material as HLW is based on its radiological characteristics and whether the material requires permanent isolation. The common element of these statutory paragraphs defining HLW is the requirement and recognition that the waste be "highly radioactive." Additionally, both paragraphs reflect a primary purpose of the NWPA, which is to define those materials for which disposal in a deep geologic repository is the only method that would provide reasonable assurance that the public and the environment will be adequately protected from the radiological hazards the materials pose. The terms "highly radioactive," and "sufficient concentrations" are not defined in the AEA or the NWPA. By providing in paragraph A that liquid reprocessing waste is HLW only if it is "highly radioactive," and that solid waste derived from liquid reprocessing waste is HLW only if it is "highly radioactive" and contains fission products in "sufficient concentrations" without further defining these standards, Congress left it to DOE to determine when these standards are met. Given Congress' intent that not all reprocessing waste is HLW, it is appropriate for DOE to use its expertise to interpret the definition of HLW, consistent with proper statutory construction, to distinguish waste that is non-HLW from waste that is HLW. At 50910, c. 2 & 3.

Comments:

No part of DOE's textual analysis is accurate. First, that the terms "highly radioactive" and "sufficient concentrations" are not defined in the AEA or the NWPA in no way obviates the glaring detail that "HLW" and "disposal" are, in point of fact, defined in explicit terms. Second, paragraph A in no way asserts that liquid reprocessing waste is HLW only if it is "highly radioactive." Congress wrote in no such limitation and if it had felt necessary to do so, it could have done so and has not. Further, it's not as if Congress has not had this matter before it during

the years and at no point has it taken steps to provide the department with the authority it so clearly seeks today.

DOE then moves on to ignore traditional rules of statutory construction and suggest that the term “including” is not simply an illustrative application of the general principle, but that it somehow provides DOE with wide authority to define out of existence a substance—HLW—that is the entire purpose of the law where it is defined in the first instance. Congress is clear that HLW is all highly radioactive material resulting from the reprocessing of spent nuclear fuel. The inquiry can halt there and there is no place for DOE's expertise, and certainly not in rewriting the law or in the technical exercise of trying to alter HLW by simply abandoning it under layers of concrete or attempting to dilute it to improperly shift its disposal path.

Further, attempts to conflate the powers that Congress granted the NRC in Paragraph B—HLW is ... “other highly radioactive material that the Commission [NRC], consistent with existing law, determines by rule requires permanent isolation”—and somehow magically reassign them to the Energy Department must fail. Congress's direction could not be more plain. HLW was defined by its source in Paragraph A, with an illustrative example provided. The NRC, the ultimate licensing body under the NWPA, may determine by rule that other highly radioactive may also require permanent isolation and therefore be disposed of in whatever repositories are ultimately selected. Attempting to transmute the authority expressly provided another agency by Congress as some wide-ranging assignment of authority provided to DOE that would flatly violate the precise intentions of the law—that HLW is to be disposed of in a deep geologic repository—has no merit. These assertions alone should cause DOE to retract this notice and start over.

It is also telling that DOE provides no citations to support the inaccurate assertions about Congress's intent in the NWPA. DOE also does not cite other relevant laws, including the Federal Facilities Compliance Act (Public Law No. 102-386), which were enacted to provide additional regulation of DOE.

7. DOE writes:

The DOE interpretation is informed by the radiological characteristics of reprocessing waste and whether the waste can be disposed of safely in a facility other than a deep geologic repository. This interpretation is based upon the principles of the NRC's regulatory structure for the disposal of low-level radioactive wastes. In its regulations, NRC has identified four classes of low-level radioactive waste (LLW)—Class A, B or C—for which near-surface disposal is safe for public health and the environment, and greater-than-Class C LLW for which near-surface disposal may be safe for public health and the environment. This waste classification regime is based on the concentration levels of a combination of specified short-lived and long-lived radionuclides in a waste stream, with Class C LLW having the highest concentration levels. Waste that exceeds the Class C levels is evaluated on a case-specific basis to determine whether it requires disposal in a deep geologic repository, or whether an alternative disposal facility can be demonstrated to provide safe disposal. The need for disposal in a deep geologic repository results from a combination of two radiological characteristics of the waste: high activity

radionuclides, including fission products, which generate high levels of radiation; and long-lived radionuclides which, if not properly disposed of, would present a risk to human health and the environment for hundreds of thousands of years. Because the NRC has long-standing regulations that set concentration limits for radionuclides in waste that is acceptable for near-surface disposal, it is reasonable to interpret "highly radioactive" to mean, at a minimum, radionuclide concentrations greater than the Class C limits. Reprocessing waste that does not exceed the Class C limits is non-HLW. DOE interprets "sufficient concentrations" in the statutory context in which the definition was enacted, which, as discussed above, is focused on protecting the public and the environment from the hazards posed by nuclear waste. In addition to the characteristics of the waste itself, the risk that reprocessing waste poses to human health and the environment depends on the physical characteristics of the disposal facility and that facility's ability to safely isolate the waste from the human environment. Relevant characteristics of a disposal facility may include the depth of disposal, use of engineered barriers, and geologic, hydrologic, and geochemical features of the site. Taking these considerations into account, it is reasonable to interpret "sufficient concentrations" to mean concentrations of fission products in combination with long-lived radionuclides that would require disposal in a deep geologic repository. At 50910, c. 3 – 50911, c. 1.

Comments:

Again, almost every sentence in the above cited paragraph has explicit flaws, unlawful and unsupported assertions, and will result in severe environmental harms in multiple locations if enacted and carried out by the Trump Administration DOE.

With respect to the claim that DOE's interpretation is "informed by the radiological characteristics of reprocessing waste and whether the waste can be disposed of safely in a facility other than a deep geologic repository," there is no basis provided for the assertion. And the assertion ignores the above discussion that Congress has spoken to this issue in the definition of HLW. In any event, the NRC is the licensing body that can decide to expand the universe of what can be disposed of in a repository, not DOE.

Next, DOE embarks on a flight of fancy, suggesting that its "interpretation is based upon the principles of the NRC's regulatory structure for the disposal of low-level radioactive wastes," which, notably, is not relevant to the disposal of HLW and spent nuclear fuel as those substances have their own law proscribing the terms of their disposal – the NWPA. Congress has spoken to this matter. The fact that Greater than Class C waste exists and that the NRC may evaluate it on a case-specific basis to determine whether it requires disposal in a deep geologic repository, is beside the point when articulating what it is DOE can do with HLW. DOE goes on to suggest that "[b]ecause the NRC has long-standing regulations that set concentration limits for radionuclides in waste that is acceptable for near-surface disposal, it is reasonable to interpret "highly radioactive" to mean, at a minimum, radionuclide concentrations greater than the Class C limits." No, it's not reasonable when the substances DOE is attempting to reinterpret have already been defined by Congress in the particular law DOE is attempting to evade.

DOE shows its hand in the next sentence—“[r]eprocessing waste that does not exceed the Class C limits is non-HLW.” It is well understood via DOE’s attempt to revive the WIR process that the agency will simply work to dilute, abandon and average any HLW with any necessary amount of concrete or some other substance such that the agency will claim it is no longer HLW. This transparent attempt at semantically defining out of existence the world’s most toxic, long-lasting waste (but not actually doing away with the waste in any meaningful fashion) endangers the environment and public health of communities across the country. DOE’s recitation of characteristics of unidentified and wholly unregulated “disposal facilities” is a meaningless exercise that insults the states and communities that will be affected for centuries by HLW abandoned or improperly and unlawfully disposed of. DOE is unregulated with respect to its management of radioactive (not chemical) waste. If the department succeeded in reinterpreting the definition of HLW and then redefined any amount of HLW out of existence as it sees fit, there is little any state or community could do to halt DOE from improper abandonment of this most dangerous material.

8. DOE writes:

Accordingly, under DOE’s interpretation, solid waste that exceeds the NRC’s Class C limits would be subject to detailed characterization and technical analysis of the radiological characteristics of the waste. This, combined with the physical characteristics of a specific disposal facility and the method of disposal, would determine whether the facility could meet its performance objectives, and if the waste can be disposed of safely. This approach would be governed by the waste characterization and analysis process and performance objectives for the disposal facility established by the applicable regulator, and thereby protective of human health and the environment. At 50911, c. 1.

Comments:

DOE’s claims that reinterpreted and reclassified HLW would be “subject to detailed characterization and technical analysis of the radiological characteristics of the waste” ignores, again, that DOE is self-regulating with respect to how it manages its radioactive waste. DOE fails to identify the regulator that would ensure this proper characterization, nor does DOE identify any specific criteria that would be employed in arriving at specific protective standards (and the agency exacerbates the profound problems with this assertion in the paragraph that follows). Indeed, the fact that DOE asserts that this—whomever or whatever “this” is—“combined with the physical characteristics of a specific disposal facility and the method of disposal, would determine whether the facility could meet its performance objectives, and if the waste can be disposed of safely” is functionally meaningless.

Indeed, via statements in the 2001-2005 HLW litigation, DOE presented a clear picture of what it intends. There, DOE challenged NRDC *et al.*’s factual presentation that the HLW the department intended to reclassify under Order 435.1 at the SRS and abandon in the tanks would have comparable – and potentially much higher – concentrations of radioactive elements than the

HLW removed from the tanks.⁷⁰ DOE defended its actions as proper not by calculating the radioactive concentration of the abandoned waste, but by averaging the highly radioactive material of the HLW with the near zero radioactivity of the “grout credited for binding up the wastes.”⁷¹

Mathematical averaging, or “dilution”, or “taking grout credit,” renders meaningless the objective of disposing of HLW in a repository. For that matter, it also renders meaningful the objective of establishing concentration limits for Class C and other waste categories in 10 CFR § 61.55. As NRDC noted more than a dozen years ago when DOE first attempted such games, DOE could just as well average the residual radioactivity in the tanks with arbitrary volumes (or mass) of earth under the tanks or the groundwater adjacent to the tanks.⁷²

Allowing DOE's newly suggested interpretation—i.e., the NWPA allows for defining away the problem of HLW and thereby abandoning it under grout or diluting it in concrete for disposal in an inappropriate site—would render meaningless the Congressional directive that HLW be disposed of in a repository. The concept of disposal by dilution of the nation's most highly radioactive waste was discarded for good nearly 50 years ago with the passage of the NWPA. If dilution were an acceptable option, Congress would not have directed HLW to be consolidated and disposed of in a geologic repository that does not rely on human monitoring and maintenance to keep the wastes from entering the biosphere. *See* House Report at 29. Ultimately, acceptance of DOE's new interpretation would nullify the entire approach Congress took to disposal of HLW because DOE (or, for that matter, commercial nuclear operators) could avoid compliance with the NWPA by averaging their HLW with the requisite amount of unmixed non-radioactive material rather than disposing of it in a repository. 42 U.S.C. §§ 10101(9), 10131. DOE may not adopt a policy—such as this interpretation of the NWPA's HLW definition—that so directly conflicts with its governing statute. *Maislin*, 497 U.S. at 134-35; *Chevron*, 467 U.S. at 843.

9. DOE writes:

The DOE interpretation does not require the removal of key radionuclides to the maximum extent that is technically and economically practical before DOE can define waste as non-HLW. Nothing in the statutory text of the AEA or the NWPA requires that radionuclides be removed to the maximum extent technically and economically practical prior to determining whether waste is HLW. DOE has determined that the removal of radionuclides from waste that already meets existing legal and technical requirements for safe transportation and disposal is unnecessary and inefficient, and does not benefit human health or the environment. To the contrary, it potentially presents a greater risk to human health and the environment because it prolongs the temporary storage of waste. At 50911, c. 1 & 2.

⁷⁰ *See* Ex. 1, Att. E, at 3.

⁷¹ This exchange and supporting documentation are found in Ex. 1, Att. D, Cochran 2nd Decl. ¶¶ 39-46. As evidenced in that exchange, it is NRDC's opinion that the only significant difference between the abandoned HLW and the HLW destined for a geologic repository is a layer of grout.

⁷² Ex. 1, Att. D, at ¶ 46.

Comments:

DOE's attempt at a newly created waste classification of material that is defined under long-standing statute has no legal merit and makes even less sense. First, DOE creates a new term out of whole cloth – “non-HLW” – and at that same moment in the same sentence, strips away any suggestion that its brand new term might bring with it any obligation to protect public health and the environment. However much DOE might like the idea that it can create a new classification – non-HLW – it cannot. Congress has already spoken to the issue. *See supra* at 4-7. Continuing the stacking of its house of cards, DOE pleads that “[n]othing in the statutory text of the AEA or the NWPA requires that radionuclides be removed to the maximum extent technically and economically practical prior to determining whether waste is HLW.” Regrettably for DOE, and fortunately for the environment and public health, there is nothing in those statutes that allows DOE this authority in the first instance. And as a technical matter with extraordinary implications, the immediately affected states, communities and tribes should find cold comfort from any cleanup assurances from DOE when the department is explicit that it is not required to remove radionuclides to the maximum extent.

The rest of the DOE's assertions are equally misplaced and, frankly, confusing. Putting aside the fact it has no authority to do this in the first instance, DOE suggests that it has “determined that the removal of radionuclides from waste that already meets existing legal and technical requirements for safe transportation,” with no explanation as to what HLW it writes about, what legal and technical requirements it will meet, or why radionuclide removal “does not benefit human health or the environment.” Nor does DOE explain how it manages to arrive at its risk/benefit calculation that “it” – whatever “it” is, “potentially presents a greater risk to human health and the environment because it prolongs the temporary storage of waste.”

As discussed (*supra*, 4-7), simply stating that the HLW does not require disposal in a deep geologic repository violates Congress's explicit instructions that HLW is to be disposed of in just such a repository. And now DOE makes clear that it plans to put some sizable percentage – or perhaps all? Who knows? – under DOE's self-regulating authority as it manages its nuclear waste. And exacerbating matters, DOE even goes so far as to suggest that the fig leaves available under Section 3116 or the Draft WIR determinations that require “removal of key radionuclides to the maximum extent that is technically and economically practical” are not even operable. Under DOE's new interpretation, there would be no regulator for HLW, no protective standards or criteria. Indeed, there would be no regulatory scheme at all. This contrary to law and a stunning display of disregard for a profound national environmental problem that will last for hundreds of thousands of years.

10. DOE writes:

Therefore, under DOE's interpretation, waste resulting from the reprocessing of SNF is non-HLW if the waste:

- I. *Does not exceed concentration limits for Class C low-level radioactive waste as set out in section 61.55 of title 10, Code of Federal Regulations; or*

- II. *Does not require disposal in a deep geologic repository and meets the performance objectives of a disposal facility as demonstrated through a performance assessment conducted in accordance with applicable regulatory requirements. Reprocessing waste meeting either I or II of the above is non-HLW, and may be classified and disposed in accordance with its radiological characteristics in an appropriate facility provided all applicable requirements of the disposal facility are met. At 50911, c. 2.*

Comments:

DOE repeats its Draft HLW Reinterpretation Proposal and for the reasons stated above, DOE should withdraw this notice and start over.

11. Other Violations Under Law.

A. The Proposed HLW Reinterpretation Violates the APA.

The Proposed HLW Reinterpretation is arbitrary and capricious and fails under the Administrative Procedure Acts (“APA”), 5 U.S.C. § 701 *et seq.* Under the APA, a regulation must be struck down if it is “arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law.”⁷³ First, courts must “. . . reject constructions of a statute that are inconsistent with the statutes or that frustrate the policy Congress sought to implement.”⁷⁴ As discussed above, the DOE’s proposed action is clearly inconsistent with the NWPA and would frustrate the intent of Congress. Second, it is well-settled that an agency’s decision must be supported by the administrative record, and there is no administrative record here at all to support the agency’s proposed reinterpretation.⁷⁵ And finally, an agency may not shift its position without supplying a reasoned explanation for doing so.⁷⁶ For decades, DOE has managed the reprocessing waste in the tanks at Hanford and the other sites as HLW, and now seeks to grant itself the authority to frustrate the intent of Congress without support from the administrative record and a rational explanation. For these reasons, the proposed reinterpretation of HLW is in violation of the APA.

Further, DOE exercises controls over environmental, safety and health primarily through its system of “orders,” but notably, DOE neither uses nor references the term “order” at any point in its HLW Reinterpretation proposal. In fact, DOE restricts its request for comments to its “interpretation,” likely attempting to avoid the invocation of a specific caution from another federal agency. According the NRC,

⁷³ 5 U.S.C. § 706(2)(A). The Draft WIR Determination is also impermissible and contrary to the APA for these reasons.

⁷⁴ *Bonneville Power Admin.*, 909 F.2d at 1306.

⁷⁵ *Sierra Club v. Dombeck*, 161 F.Supp.2d 1052, 1070 (D.Ariz. 2001), *citing Motor Vehicle Mfgs. Ass’n. v. State Farm*, 463 U.S. 29, 43 (*State Farm*).

⁷⁶ *National Coalition Against the Misuse of Pesticides v. Thomas*, 809 F.2d 875, 883 (D.C. Cir. 1987); see also *State Farm*, 463 U.S. at 57.

DOE Safety Orders were not promulgated according to the Administrative Procedures Act requirements and are not legally binding. The Administrative Procedures Act requires public noticing and a comment period, among other things, before an Order is promulgated. Absent this process, Orders can be incorporated into a contract to be administratively enforceable under the terms and remedies provided in the contract. Without a statutory or contractual requirement, implementation of a particular Order typically involved an agreement by DOE to compensate the contractor for any additional burden associated with Order compliance.⁷⁷

And because DOE sites and the cleanup of HLW in the DOE nuclear weapons complex operate under cost-plus contracts,⁷⁸ the Energy Department must pay the additional costs of compliance with safety orders. Avoiding the formality of federal notice and comment rules and, for that matter, even DOE's own internal order system, will allow DOE to potentially avoid a host of safety requirements at individual sites, without any legal requirement for public knowledge or opportunity to weigh in on the matter. Safety orders for practices involving highly radioactive and/or toxic materials can be watered down for any number of financial reasons—if schedules slip, if costs are exceeded, or, sometimes, if a contractor simply stands to lose out on a bonus.

Thus, removing vast amounts of HLW by a semantic wave of a magic reinterpretation wand could have enormous cost savings for DOE. By contrast, NRC, which regulates HLW generated by the US commercial nuclear reactor fleet – and putting aside for another day the adequacy of these regulations – has a developed system of formal regulations that have the force of law, are subject to fines and penalties; and unlike DOE's orders, NRC standards are subject to the transparency requirements of the APA and are issued to licensees as mandatory obligations. DOE's actions, in this instance, are arbitrary and capricious. We would also note the fact that previous AEC/ERDA/DOE “cost-saving actions” (i.e., single-shelled tanks) have resulted in *increased* long-term costs, as well as additional environmental contamination.⁷⁹

B. The Proposed HLW Reinterpretation Violates the National Environmental Policy Act.

As a last matter, it should also go without saying that DOE's HLW Reinterpretation Proposal falls squarely within the four corner of the National Environmental Policy Act, 42 U.S.C. §4321, *et seq.* The Proposal, if finalized, would be a major federal action affecting the environment and there is no DOE NEPA document that specifically addresses the myriad of environmental harms attendant to this proposed decision to abandon waste in the HLW tanks. Nearly 8 years ago,

⁷⁷ See, *Overview and Summary of NRC Involvement with DOE in the Tank Waste Remediation System-Privatization (TWRS-P) Program*, U.S. Nuclear Regulatory Commission, NUREG-1749, (2001), at 259.

⁷⁸ DOE uses cost-plus-award-fee (CPAF), cost-plus-incentive-fee (CPIF), and cost-plus-fixed-fee (CPFF) contracts where a contractor can be paid for all of its allowed expenses, plus additional payment to allow for a profit. See <https://www.energy.gov/em/em-contractor-fee-determinations>.

⁷⁹ See, Ex. 2.

NRDC and HC addressed DOE's Tank Closure and Waste Management Draft Environmental Impact Statement and we incorporate by reference those comments here today.⁸⁰

But further, for DOE to proceed without any NEPA coverage at all of this explicit action (and segment the NEPA review of a later and likely WIR Determination resulting from this action) is to avoid the fundamental requirement of NEPA, to search and subject to a "hard look" the *environmental impact comparison of reasonable alternatives* required under NEPA.⁸¹ CEQ's regulations governing implementation of NEPA direct that Federal agencies "shall to the fullest extent possible....(b)...emphasize *real environmental issues and alternatives*...(e) Use the NEPA process to identify and assess the *reasonable alternatives to proposed actions that will avoid or minimize adverse effects of these actions* upon the quality of the human environment."⁸² In setting out the fundamental purpose of an EIS, CEQ's regulations also state, "It [the EIS] shall provide full and fair discussion of significant environmental impacts and shall inform decisionmakers and the public of the *reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment*. Agencies shall focus on *significant environmental issues and alternatives*...."⁸³ Satisfying these requirements is a non-discretionary duty of the DOE's NEPA process and obligations under the law.

These are not idle, semantic concerns. DOE's HLW Reinterpretation Proposal makes clear that DOE has intentions to either abandon or improperly dispose of HLW in near surface disposal, precisely contrary to the directions of Congress under the NWPA. Any such major federal action should be accompanied by a NEPA analysis that addresses the potential environmental and social impacts of plainly necessary institutional controls.

Institutional controls, long a part of environmental law, play a crucial role in selecting how best to protect the public from incomplete cleanups where contamination is left on site for extended periods of time. Institutional controls are shorthand descriptions for restrictions placed on land, surface water or groundwater use when it is either technically impossible or economically prohibitive to permanently remove the source of pollution or contamination. The types of restrictions can be "active" institutional controls – often colloquially described as "guns, gates and guards" – or "passive" institutional controls, which range from warning notices to keep trespassers off contaminated sites to deed restrictions specifying how the land can be used henceforth. Regardless of whether institutional controls are active or passive, the purpose is to isolate the remaining contamination or potential harm from the public in an enduring fashion. The study of institutional controls in environmental law and policy is a legacy of incomplete cleanup of both chemical and radioactive sites around the country. Indeed, the United States has thousands of large and small contaminated sites overlain by a myriad of state and federal regulatory regimes where it was either not cost-effective or technically feasible to reduce the volume of contamination to levels that provide adequate protection for unrestricted uses. Thus, institutional controls exist, agencies adopt policies to implement those controls, and in this HLW

⁸⁰ NRDC and Hanford Challenge, *Draft Tank Closure and Waste Management Environmental Impact Statement Comments*, May 3, 2010, attached as Ex. 3.

⁸¹ See NEPA, 42 U.S.C. §4321, *et seq.*; see also 40 C.F.R. §1502.14, 10 C.F.R. 51.85, and § 51.10-125 and App A.

⁸² 40 C.F.R. §1500.2 (emphasis added).

⁸³ 40 C.F.R. §1502.1 (emphasis added).

Reinterpretation Proposal, DOE suggests it can properly “reinterpret” what has heretofore been HLW out of existence and ensure safe disposal, without any specific explanation of how the HLW has been changed and how applicable institutional controls might persevere.

Several agencies, including DOE, have adopted policies either implementing or relying on institutional controls. Each agency explicitly declines to rely on active institutional controls for more than 100 years and on passive controls or engineered barriers for more than 500 years. The NRC's licensing requirements for land disposal of radioactive waste as an example, state:

The land owner or custodial agency shall carry out an institutional control program to physically control access to the disposal site following transfer of control of the disposal site from the disposal site operator. The institutional control program must also include, but not be limited to, carrying out an environmental monitoring program at the disposal site, periodic surveillance, minor custodial care, and other requirements as determined by the Commission; and administration of funds to cover the costs for these activities. The period of institutional controls will be determined by the Commission, but institutional controls may not be relied upon for more than 100 years following transfer of control of the disposal site to the owner.

10 C.F.R. §61.59(b).

Unfortunately, institutional controls have become necessities for the simple reason the polluting entity or government cannot always remove the entirety of contamination from a particular site. Federal agencies have adopted regulations explicitly recognizing the difficulties of long-term reliance on institutional controls. And more to the point, there are numerous examples of how and why the institutional controls fail. Even a few examples illustrate the problems facing reliance on institutional controls and the difficulties in formulating “durable,” protective remedies for long-term contaminated sites.

DOE itself, for example, created the Office of Legacy Management in its Environmental Management Program. The Office of Legacy Management's mission is to manage the long-term stewardship of contaminated nuclear weapons sites *after* whatever cleanup has been done has concluded.⁸⁴ Despite a multi-billion per year cleanup program and this office, the government appears to have lost track of significant numbers of formerly utilized sites that remain contaminated. A series in the Wall Street Journal by John Emshwiller documented continuing problems at a variety of sites which have receded from the institutional memory of the agencies responsible for assuring they are cleaned up.⁸⁵

⁸⁴ See DOE's Office of Legacy Management online at <http://energy.gov/lm/office-legacy-management>.

⁸⁵ See, e.g., Emshwiller and Singer-Vine, “Waste-Lands: A Forgotten Legacy of Nuclear Buildup,” *Wall Street Journal*, October 30, 2013. *Cf.*, for an even more dispiriting example, Jacob Darwin Hamblin, *Poison in the Well: Radioactive Waste in the Oceans at the Dawn of the Nuclear Age*, Rutgers University Press, 2008; and W. Jackson Davis, John Van Dyke, Daniel Hirsch, Mary Anne Magnier, Sherry P. Broeder, *Evaluation of Oceanic Radioactive Dumping Programs*, study presented by the nations of Nauru and Kiribati to the London Dumping Convention, LDC7/INF.2, 1982. Here, from 1946 to approximately 1970, the AEC approved disposing of radioactive wastes by

Finally, in a thorough report addressing concerns that institutional controls may not effectively protect human health and the environment in the context of chemical contamination, in 2005 the Government Accountability Office reviewed (1) the extent to which institutional controls are used at sites addressed by EPA's Superfund and RCRA corrective action programs; (2) the extent to which EPA ensures that institutional controls at these sites are implemented, monitored, and enforced; and (3) EPA's challenges in implementing systems to track these controls.⁸⁶ The GAO found institutional controls were used at most of the Superfund and RCRA sites where cleanup was completed and waste was left in place. Further, the GAO found that while EPA's guidance advises that four key factors be taken into account in selecting controls for a site (the objective, mechanism, timing and responsibility for the institutional control), 69 of the 108 remedy decision documents examined did not demonstrate that all of these factors were sufficiently considered to ensure that planned controls will be adequately implemented, monitored, and enforced.⁸⁷ The GAO explained:

Although EPA has taken a number of steps to improve the management of institutional controls in recent years, we found that controls at the Superfund sites we reviewed were often not implemented before site deletion, as EPA requires. In some cases, institutional controls were implemented after site deletion while, in other cases, controls were not implemented at all. An EPA program official believed that these deviations from EPA's guidance may have occurred because, during the sometimes lengthy period between the completion of the cleanup and site deletion, site managers may have inadvertently overlooked the need to implement the institutional controls.⁸⁸

We conclude this final section of our comments on DOE's arbitrary and capricious reinterpretation proposal with the National Academy of Sciences observation that "institutional controls *will fail*."⁸⁹ As was explained to the Ninth Circuit in the original round of litigation years ago describing the reprocessing waste, the half-life (the time it takes for one-half of an unstable isotope of the element to be lost through radioactive decay) of some of the isotopes which have leaked are as follows: cesium-137, 30 years; strontium-90, 29 years; plutonium-239, 24,110 years; and uranium-238, about 4.5 billion years. A rule of thumb is that after 10 times the half-life of an isotope, about 0.1 percent of its original value remains and the rest has decayed away. Thus, it will take about 240,000 years before plutonium-239 has all but decayed away. By way of comparison, the civilization recognized by many historians to be among the oldest—the

dumping at sea. Wastes were placed in various kinds of packages, predominantly 55-gallon drums, placed on tugs or ships, taken out to ocean dumpsites, and tossed overboard.

⁸⁶ See *Hazardous Waste Sites: Improved Effectiveness Of Controls At Sites Could Better Protect The Public*, Government Accountability Office, GAO-05-163, January 2005, <http://www.gao.gov/assets/250/245140.pdf>.

⁸⁷ *Id.* at 5.

⁸⁸ *Id.* at 6.

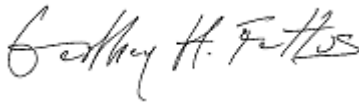
⁸⁹ See National Academy of Sciences/National Research Council, Board on Radioactive Waste Management, *Committee on the Remediation of Buried and Tank Waste, Long-Term Institutional Management of the U.S. Department of Energy Legacy Waste Sites*, August 2000, at page 97 (emphasis added).

Mesopotamian—is understood to have begun less than 6,000 years ago. Kennewick Man walked near DOE's Hanford site on the "Columbia Plateau an estimated 8,340 to 9,200 years ago."⁹⁰ The last Lake Missoula flood that scoured eastern Washington and rerouted rivers at the end of the most recent Ice Age was only about 12,000 years ago.⁹¹ To assert that DOE's newly proposed "interpretation" of HLW – which could lead to the abandonment and improper disposal of the most toxic waste in the world – could have lasting implications, vastly understates the matter.

V. Conclusion

For the reasons stated above, we urge you to withdraw this HLW Reinterpretation Proposal and commence working with the immediately affected States, Tribes, Congress and interested members of the public on reforms to nuclear waste law and putting the cleanup of the nuclear weapons complex on a course that is both scientifically defensible and publicly accepted.

Sincerely,



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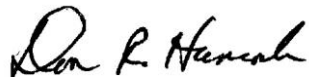
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⁹⁰ *Bonnichsen v United States*, 357 F.3d 962, 966 (9th Cir. 2004).

⁹¹ Response Brief of Appellees Natural Resources Defense Council and Snake River Alliance at 8, n.6.



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November 7, 2018

Via Electronic Mail

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RE: NRDC/Hanford Challenge and Columbia Riverkeeper Comments on *Draft Waste Incidental to Reprocessing Evaluation for Closure of Waste Management Area C at the Hanford Site, Washington*

Dear Mr. Bovier:

The Natural Resources Defense Council (NRDC), Hanford Challenge (HC), and Columbia Riverkeeper (CRK) write today to comment on the Department of Energy's *Notice of Availability of the Draft Waste Incidental to Reprocessing Evaluation for Closure of Waste Management Area C at the Hanford Site, Washington*. 83 Fed. Reg. 25657, June 4, 2018 (hereinafter "Area C Draft WIR Determination") (comment deadline extended to this date, 83 Fed. Reg. 40758, August 16, 2018).

The Area C Draft WIR Determination is contrary to law, technically indefensible, and sets a precedent for abandoning extraordinary amounts of the most toxic waste in the world adjacent to the Columbia River without protection from external regulatory oversight or, indeed, any meaningful environmental standards. Rather than continue a course that is sure to end up in litigation, we urge you to withdraw the Draft Determination and commence working with the immediately affected States of Washington and Oregon, the Confederated Yakama Tribes, and interested members of the public on a cleanup trajectory for the high-level radioactive wastes (HLW) in the more than 177 tanks at the Hanford Nuclear Reservation that is both scientifically defensible and publicly accepted.

I. NRDC, HC & CRK Statement of Interest

NRDC is a national non-profit membership environmental organization with offices in Washington, D.C., New York City, San Francisco, Chicago, Los Angeles and Beijing. NRDC has a nationwide membership of over one million combined members and activists. NRDC's activities include maintaining and enhancing environmental quality and monitoring federal agency actions to ensure that federal statutes enacted to protect human health and the environment are fully and properly implemented. Since its inception in 1970, NRDC has sought to improve the environmental, health, and safety conditions at the nuclear facilities operated by the U.S. Department of Energy ("DOE" or "Department") and its predecessor agencies.

Hanford Challenge is a non-profit, public interest, environmental and worker advocacy organization located at 2719 East Madison Street, Suite 304, Seattle, WA 98112. Hanford Challenge is an independent 501(c)(3) membership organization incorporated in the State of Washington and dedicated to creating a future for Hanford that secures human health and safety, advances accountability, and promotes a sustainable environmental legacy. Hanford Challenge has members who work at the Hanford Site and within the Tank Farms who are at risk of imminent and substantial endangerment due to DOE's handling, storage, treatment, transportation, and disposal of Hanford's solid and hazardous waste. Other members of Hanford Challenge work and/or recreate near Hanford, where they may also be affected by hazardous materials emitted into the environment by Hanford. All members have a strong interest in ensuring the safe and effective cleanup of the nation's most toxic nuclear site for themselves and for current and future generations, and who are therefore affected by conditions that endanger human health and the environment.

Columbia Riverkeeper (CRK) is a 501(c)(3) nonprofit organization with a mission to protect and restore the Columbia River, from its headwaters to the Pacific Ocean. Since 1989, Riverkeeper and its predecessor organizations have played an active role in educating the public about Hanford, increasing public participation in cleanup decisions, and monitoring and improving cleanup activities at Hanford. Columbia Riverkeeper and its 13,000 members in Oregon and Washington have a strong interest in protecting the Columbia River, people, fish, and wildlife from contamination at Hanford, including pollution originating in Hanford's tank farms.

II. Summary Comments

It is rare that we express amazement in a formal letter of comments for a public record, but we do so in this instance. This past summer, the DOE announced the availability of the Draft WIR Determination for the closing 16 HLW tanks in Area C in the Hanford Nuclear Reservation. DOE asserts that its Draft Determination demonstrates that the tanks and ancillary structures, from which waste has been or will be removed, is waste that is incidental to reprocessing, is not high-level radioactive waste (HLW), and may be managed (disposed in-place) as low-level radioactive waste (LLW).¹ DOE prepared the Draft WIR Evaluation pursuant to DOE Order

¹ See U.S. Department of Energy, [Draft Waste Incidental to Reprocessing Evaluation for Closure of Waste Management Area C at the Hanford Site](#) (March 2018).

435.1, *Radioactive Waste Management*, and the criteria in DOE Manual 435.1–1, *Radioactive Waste Management Manual*.²

Fundamentally, DOE has proposed a straightforward action. The Department plans to reclassify thousands of gallons of HLW in 16 tanks at the Hanford site, and thereby leave that waste in place, under a layer of grout. Nowhere, not in the 312 pages of the Draft WIR Determination itself or the 1023 pages of the appended Performance Assessment, does the DOE mention, discuss, analyze, or even acknowledge the *years of litigation and the ferocious battle before the United States' Congress on precisely this issue*, that is, the reclassification of HLW, followed by abandonment in place, under a layer of grout. Indeed, those years of litigation, from 2001-2005, elicited an act of Congress to (partially) legislatively reverse the Federal District Court decision that barred DOE from unlawfully reclassifying HLW, with specific and explicit implications for the draft action under consideration this day. That act, Section 3116 of the 2005 National Defense Authorization Act, receives a brief nod in its direction in the text of the Draft WIR Determination. But again, nowhere does DOE discuss, analyze or even acknowledge that the gruesomely contentious battle over Section 3116 explicitly bars DOE's reclassification effort at Hanford.

NRDC et al. believes that the WIR evaluation should have included consideration of the Hanford Site Composite Analysis to ensure that risks from multiple waste sites and sources were all considered. In the public meetings and materials provided by DOE during this public comment period, there were many statements that the Hanford Site Composite Analysis would be considered and that the waste in the soils below the tanks would be dealt with separately. We do not agree with the piecemeal approach.

Although DOE held public meetings in Richland, WA, Portland, OR and Seattle, WA, we were disappointed that there was no effort to hold public hearings to gather comments around the region. Comprehensive public process on this issue concerning some of the most dangerous waste at Hanford is essential. We hope that future public comment periods related to Hanford's tank waste will include regional public hearings to allow for the kind of deliberation that is required for the public to learn about, ask questions, and share input related to decisions that impact the environment and future generations for hundreds of thousands of years.

We will detail all of this in the pages that follow, but we stand amazed that something as profound as this—the abandonment of tens of thousands of gallons of the most toxic waste in the world next to the Columbia River, the lifeblood of Washington and Oregon—entirely omits the most meaningful events in recent history that go right to the heart of whether the Trump Administration DOE can even take this action. An action which, in its most clear terms, violates the law that was the result of the legal battles that will be described in the next several pages. Despite this baffling omission of relevant history, it is plain that DOE's Draft WIR Determination violates the law, fails as a technical cleanup policy document, will not protect human health and the environment, and therefore must be withdrawn. We urge the Department to

² U.S. Department of Energy, [Draft Waste Incidental to Reprocessing Evaluation for Closure of Waste Management Area C at the Hanford Site](#) (March 2018), p. 1-1.

go back to the drawing board and commence a transparent public process, led by the States of Washington, Oregon, the Confederated Tribes and Bands of the Yakama Nation, and concerned members of the public that can finally put the cleanup of the Hanford HLW tanks on a course that is both scientifically defensible and publicly accepted.

III. Background History

A. Historical and Legal Background

The roots of this matter date back to the Manhattan Project of World War II. DOE, through almost 50 years of nuclear fuel reprocessing, generated approximately 525 million gallons of High Level Waste (“HLW”) at Hanford alone³, most of it associated with the production of plutonium and tritium for nuclear weapons. This waste is so radioactive, toxic and dangerous to manage that it merited passage of its own law outlining the requirements of final disposal, the Nuclear Waste Policy Act (“NWPA”), 42 U.S.C. § 10101 *et seq.* Passed by Congress decades ago, in 1982, after significant inquiry and debate, the NWPA requires deep, geologic isolation for all HLW, as far from the human biosphere as possible.⁴

The Early Years

But the relevant history dates back even a bit farther. In a 1957 report, prepared at the request of the U.S. Atomic Energy Commission (AEC), the National Research Council of the U.S. National Academies “endorsed the concept of geological disposal—placing high-level waste (HLW) in a carefully selected deep underground formation, where it would remain isolated from human beings and the environment long enough for the radioactivity to decay to near natural background levels.”⁵ Notably, this 1957 technical observation remains the consensus for federal and state governments, tribes, industry, and public interest groups. Parallel, related, but ultimately distinct from the long history of commercial spent nuclear fuel, the AEC first formally defined the term “high-level radioactive waste” in Appendix F to its reactor licensing rules in 1970,⁶ based on the waste’s origin rather than the hazard posed by its various components. The AEC wrote that high level radioactive waste means:

those aqueous wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuels.⁷

³ R.E. Gephart, A Short History of Hanford Waste Generation, Storage, and Release, PNNL-13605 Rev. 4, (2003), p. 6.

⁴ See H.R. Rep. No. 97-491, 97th Cong., 2d Sess. at 26-30 (1982).

⁵ National Research Council, Disposition of High-Level Waste and Spent Fuel: The Continuing Societal and Technical Challenges, Washington, D.C.: National Academy Press, 2001, p. ix.

⁶ Policy Relating to the Siting of Fuel Reprocessing Plants and Related Waste Management Facilities, 35 Fed. Reg. 17530, 17532 (Nov. 14, 1970) (10 C.F.R. Part 50, App. F). Until this treatment, the AEC had informally defined high-level waste in terms of the hazard it posed. Office of Technology Assessment, Managing the Nation’s Commercial High-Level Radioactive Waste 204-205 (1985), available at http://govinfo.library.unt.edu/ota/Ota_4/DATA/1985/8514.PDF.

⁷ *Id.*

It was in 1972 that Congress first used the term. In the Marine Protection, Research, and Sanctuaries Act of 1972, which prohibited ocean dumping of HLW, Congress wrote a definition that adhered to that of the AEC's, but also included the spent fuel from commercial reactors. HLW was, at that time:

the aqueous waste resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated waste from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuels, or irradiated fuel from nuclear power reactors.⁸

As DOE is well aware, the AEC was abolished with the Energy Reorganization Act of 1974, and Congress transferred all civilian regulatory responsibilities to the Nuclear Regulatory Commission (NRC) and nuclear weapons activities to the Energy Research and Development Administration (which was replaced by DOE in 1977). ERDA did not specifically authorize external regulation (by the NRC) of the weapons activities. It did, however, specifically authorize the Commission to license and regulate any "facilities authorized for the express purpose of subsequent long-term storage of high-level radioactive waste generated by the Administration...."⁹

The ERDA/DOE Years & Continued Management in the Tanks

The Energy Reorganization Act, focused on the transfer of power among newly created federal agencies, did not define "high-level radioactive waste." The term was, however, interpreted to mean the same thing in the Energy Reorganization Act that it meant in the AEC's Appendix F and the Marine Sanctuaries Act.¹⁰ ERDA plainly viewed the material stored in the tanks at Hanford and Savannah River to be high-level radioactive wastes.¹¹ Those wastes in the tanks remained under the self-regulatory purview of the newly created DOE a few years after, even as it was becoming clear that the industry dream of a closed fuel cycle would not come true and this waste would have to be prepared in some fashion for disposal in deep geologic repositories.

In managing the HLW in the tanks and with theoretically readying that waste for final disposal, DOE has kept the HLW in huge, underground interim storage tanks at the Savannah River Site ("SRS") in South Carolina, the Idaho National Engineering Laboratory in Idaho ("INEL") and the Hanford Nuclear Reservation in Washington. Over these many decades of storage, hundreds of thousands of gallons of this waste have leaked into the environment, primarily at Hanford. Because this HLW contains highly corrosive components, organics, and heavy metals, it is also a mixed waste regulated under the Resource Conservation & Recovery Act ("RCRA"), 42 U.S.C. §§6901-6992k.

⁸ 33 U.S.C. 1402.

⁹ 42 U.S.C. 5842 (4).

¹⁰ 52 Fed. Reg. 5992, 5993 (Feb. 27, 1987).

¹¹ *NRDC v. Administrator, ERDA*, 451 F. Supp. 1245, 1251 (D. D.C. 1978), *aff'd in part and rev'd in part, NRDC v. NRC*, 606 F.2d 1261 (D.C. Cir. 1979).

The affected public, States, Tribes and even the Trump Administration DOE would likely agree that management and (hopefully someday) disposal of the HLW tanks is one of DOE's most difficult problems in addressing the environmental legacy of the Cold War. Various plans for tank waste management and disposal have been forwarded, acted upon, or discarded, including transferring pumpable liquids from single-shelled tanks to double-shelled tanks (at Hanford), heating the waste to convert it to a powdery form (called calcining at INEL), and vitrifying the waste (a process that stabilizes radioactive waste by mixing it with molten glass) for disposal at a geologic repository pursuant to the NWPA (currently ongoing at the SRS's Defense Waste Processing Facility ("DWPF") and in the process of being attempted at the Hanford site now for decades without success). Since the passage of the NWPA in 1982 and a Presidential Directive issued pursuant to that Act in 1985, defense HLW has been required to be removed from the tanks and disposed of in a deep geologic repository pursuant to the requirements of the NWPA.¹²

The Nuclear Waste Policy Act (NWPA)

The first draft of the definition of "high-level radioactive waste" used in the NWPA was initially modeled after the definition found in the West Valley Demonstration Project Act, but its evolution is worth noting. The West Valley Act definition, like the AEC's original in 1970 and the first statutory definition that closely followed in 1972, defined the term as waste "produced by the reprocessing ... of spent nuclear fuel," and included "both liquid wastes which are produced directly in reprocessing" and "dry solid material derived from such liquid waste." The NWPA definition, however, also provides that the NRC may include "such other material" as may be necessary "for purposes of protecting the public health and safety."¹³ Significantly, the West Valley Act gave the Commission the power to add material other than reprocessing wastes to the definition, but not to exempt any part of the reprocessing wastes from it. DOE objected to the definition and recommended that it be rewritten to "permit the regulatory agencies to exclude materials from 'high-level radioactive waste' that need not be disposed of in a repository because of low activity."¹⁴ Congress rewrote that definition, but not as the Department asked. As enacted, the final definition provides that "high-level radioactive waste" means:

(A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and

(B) other highly radioactive material that the Commission, consistent with existing law, determines by rule requires permanent isolation.¹⁵

¹² 42 U.S.C. § 10107(b)(2).

¹³ Public Law 96-368, sec. 6(4) (42 U.S.C. § 2021).

¹⁴ H. Rept. 97-491 (part 2) at 17 (1982) (letter from Eric Fygi to Chairman Price).

¹⁵ 42 U.S.C. § 10101(12). The Price-Anderson Amendments Act of 1988, Public Law 100-408, later incorporated the Nuclear Waste Policy Act's definition of "high-level radioactive waste" into the Atomic Energy Act of 1954 by reference. 42 U.S.C. § 2014(dd).

The NRC has interpreted subparagraph (A) as “essentially identical” to Commission’s regulatory definition,¹⁶ with one major difference. NRC’s definition includes “solids into which such liquid wastes have been converted.”¹⁷ The NWSA’s definition states “solid material derived from such liquid waste *that contains fission products in sufficient concentrations.*”¹⁸ NRC read the distinction to “reflect the possibility that liquid reprocessing wastes may be partitioned or otherwise treated so that some of the solidified products will contain substantially reduced concentrations of radionuclides.”¹⁹

NRC’s Advance Notice of Proposed Rulemaking

In 1987, the NRC sought public comment on “whether the Commission should (1) numerically specify the concentrations of fission products which it would consider ‘sufficient’ to distinguish” high-level radioactive waste from non-high-level radioactive waste under subparagraph (A) of the statutory definition; or (2) define high-level radioactive waste “so as to equate” subparagraph (A) wastes “with those wastes which have traditionally been regarded as” high-level radioactive waste “under Appendix F ... and the Energy Reorganization Act.”²⁰ After some significant discussion of its authorities, vis-a-vis setting standards for what might constitute sufficient concentrations of HLW, NRC concluded “that the preferable construction” of the NWSA’s definition should “conform to the traditional definition” found in all the earlier iterations and 10 C.F.R. §60.2. What had been HLW remained HLW.²¹

B. Reclassification of HLW and the History of HLW Litigation Omitted by DOE

After NRC’s effort at rulemaking; after some years in consultation and preparation; and after the permanent abandonment of thousands of gallons of HLW in two tanks in South Carolina, DOE issued an internal rule, Order 435.1, on July 9, 1999. NRDC and the Snake River Alliance initially filed suit in the United States Court of Appeals for the 9th Circuit in January 2000 challenging one section of Order 435.1, the “waste incidental to reprocessing exemption” (“WIR” or “incidental waste exemption”). After finding that it lacked original or exclusive jurisdiction to entertain Plaintiffs’ claims under 42 U.S.C. § 10139, the 9th Circuit did not dismiss the case. Rather, the Court transferred the matter to the United States District Court for the District of Idaho, expressly leaving issues of standing, ripeness, and the merits to the District Court.²²

After the transfer, NRDC *et al.*, was joined by the Yakama Nation and Shoshone-Bannock Tribes. The combined set of plaintiffs filed a Complaint in February 2002. DOE filed an Answer in April 2002 and a Motion to Dismiss the Complaint in May 2002. At this point, the states of

¹⁶ See 52 Fed. Reg. at 5994. NRC’s HLW disposal rules, adopted before NWSA’s 1982 enactment, include: (1) irradiated reactor fuel; (2) liquid reprocessing wastes as defined in the AEC’s Appendix F; and (3) “solids into which such liquid wastes have been converted.” 10 C.F.R. § 60.2.

¹⁷ 10 C.F.R. § 60.2.

¹⁸ 42 U.S.C. § 10101(12)(A) (emphasis added).

¹⁹ 52 Fed. Reg. at 5994.

²⁰ 52 Fed. Reg. at 5994.

²¹ 53 Fed. Reg. 17709 (May 18, 1988).

²² *Natural Resources Defense Council v. Abraham*, 244 F.3d 742, 747 (9th Cir. 2001).

Washington, Idaho, South Carolina, and Oregon entered appearances as “Amici Curiae” in the proceeding. The District Court issued an opinion denying DOE’s Motion to Dismiss on August 9, 2002.²³ The Court found that Plaintiffs had standing²⁴ and that Order 435.1 was both final agency action and ripe for purposes of judicial review.²⁵ The District Court found that Plaintiffs had presented claims upon which relief could be granted and that the law of the case did not prevent consideration of those claims.²⁶ The District Court found that Order 435.1 and its accompanying Manual and Guidance necessarily implicate the disposal provisions of the NWPA by reclassifying HLW as low-level radioactive waste (“LLW”).²⁷ The Court also held that DOE do not operate with unfettered discretion with regard to the disposal of radioactive waste.²⁸

NRDC *et al* and the Bush Administration’s DOE then filed cross-motions for summary judgment. The District Court reaffirmed two earlier rulings: (1) its ripeness decision; and (2) its decision that DOE does not have discretion to dispose of defense HLW somewhere other than a repository established under the NWPA.²⁹ Specifically, the court found that the NWPA plainly required the Department to use the civilian repository for defense high-level radioactive waste once President Reagan decided that a separate repository was not required, and that the tank wastes at Hanford, Savannah River, and INEEL fall within the definition of high-level radioactive waste. The Department’s assertion that it can exempt waste streams based on technical and economic constraints, the court found, “directly conflicts with” the Act’s definition of high-level radioactive waste.³⁰ The District Court also found that Congress has spoken clearly on the subject and that DOE’s Order 435.1 directly conflicts with the NWPA’s definition of HLW (citing *Chevron v. NRDC*, 467 U.S. 837, 842 (1984)).³¹ Accordingly, the District Court granted Plaintiffs’ Motion for Summary Judgment and denied DOE’s Cross-Motion for Summary Judgment.³²

Notably, the Court was clearly cognizant that we, NRDC in that instance, did not challenge the traditional notion of “incidental” waste materials contaminated during reprocessing operations that has long been recognized by the AEC and the NRC. The Court was also aware that at no point did we challenge the NRC’s authority to exempt solid materials derived from liquid reprocessing waste that contain sufficiently low concentrations of fission products to not require deep geologic disposal as provided by the NWPA. Judge Winmill held that NWPA does not give the Department the authority to adopt an alternative disposal regime for high-level radioactive wastes merely because the Department decides “that it is too expensive or too difficult” to dispose of it in a deep geologic repository.³³

²³ *Natural Resources Defense Council v. Abraham*, 2002 U.S. Dist. LEXIS 28418 (D. Id. Aug. 9, 2002). See Attachment F for District Court opinion.

²⁴ *Id.* at 20.

²⁵ *Id.* at 7-11.

²⁶ *Id.* at 15.

²⁷ *Id.* at 17.

²⁸ *Id.* at 19.

²⁹ ER 354-58; see published opinion, *NRDC v. Abraham*, 271 F.Supp.2d 1260, 1263-64 (D. Id. 2003).

³⁰ *Natural Resources Defense Council v. Abraham*, 271 F. Supp. 2d 1260 (D. Ida. 2003).

³¹ *Id.*

³² *Id.* at 1263.

³³ *Id.* at 1265.

DOE appealed to the matter to the United States Court of Appeals for the 9th Circuit. The 9th Circuit subsequently found that the matter was not ripe for review.³⁴ Importantly, the Ninth Circuit did not reach the merits of the Idaho Federal District Court's decision and put the legality of DOE's waste reclassification actions off for another day. Washington, South Carolina and other States filed Amicus briefs in support of NRDC at both the District Court and appellate court stages.³⁵ The 9th Circuit avoided deciding the issue in 2004. It may not be able to do so if DOE finalizes its Draft WIR Determination as it's currently written.

C. The Legislation that Emerged from the HLW Litigation – Section 3116

Contemporaneous with the Ninth Circuit's review of the Idaho Federal District Court's decision, the then Bush Administration DOE sought to have the District Court decision legislatively reversed by Congress. DOE succeeded in part, and failed in part, with this effort, named Section 3116 of the *FY 2005 Defense Authorization Act*. See P.L. 108-375, *The Ronald Reagan National Defense Authorization Act of Fiscal Year 2005* (hereinafter "NDAA" and "Section 3116"). Senator Lindsey Graham (R-SC) was the primary proponent for Section 3116 and succeeded in inserting a provision into the 2005 Defense Authorization Act that substantially amends the Nuclear Waste Policy Act (NWPA).

Section 3116 spelled out criteria for the Energy Secretary to determine that the HLW can be reclassified as incidental waste (and thus can be disposed of on-site and in place) via amendments that provided DOE with authority to reclassify HLW as "waste incidental to reprocessing." Therefore, under this law, DOE can dispose of this reclassified HLW according to requirements other than those specified by NWPA (*i.e.*, the HLW will no longer have to be disposed of in a geologic repository and can be disposed of according to standards and performance objectives applicable to low-level radioactive waste (LLW)).

But the law restricted this activity to South Carolina and Idaho. The law states in pertinent part: "COVERED STATES.—For purposes of this section, the following States are covered States: (1) The State of South Carolina. (2) The State of Idaho." Section 3116(d)(1)(2). Thus, DOE was expressly barred by the terms of Section 3116 from reclassifying HLW in Washington and New York. Under those criteria, in SC and ID only, DOE may reclassify as "incidental" waste that exceeds the performance objectives for the disposal of low-level radioactive waste, 10 C.F.R. §61.40 (*i.e.*, waste that is not actually low-level waste), so long as it has (1) removed highly radioactive radionuclides "to the maximum extent practical" and (2) has obtained a state issued permit, authority for the issuance of which is conferred on the State outside of Section 3116. At SRS, pursuant to this authority, DOE "determined" that certain HLW in the underground tanks is "incidental" waste. 71 Fed. Reg. 3,838 (Jan. 24, 2006). As a practical matter, this means that DOE can undertake a process to reclassify HLW in South Carolina and Idaho. Conversely, DOE

³⁴ *NRDC v. Abraham*, 388 F.3d 701 (9th Cir. 2004).

³⁵ *Id.* at 707, 708, ("Despite NRDC's anxiety, the courts must await the coming of a proper time for decision, if, in the long run, that time ever comes. Maybe it never will come because DOE will not take actions that require—or even seem to require—court intervention. Who knows? In fine, the issue is not yet ripe.").

cannot reclassify the HLW that currently rests in the tanks at the Hanford site in Washington and West Valley site in New York.

As NRDC has repeatedly noted, this does not mean that DOE cannot remove waste from the tanks, treat it such that it no longer has fission products in sufficient concentration, and dispose of that waste in a manner other than in a geologic repository. What DOE cannot do in Washington or New York is declare the HLW in the tanks to “waste incidental to reprocessing.” *See* 271 F.Supp.2d at 1265.

D. The Congressional Fight over Section 3116

The alteration of the HLW definition authored by Senator Graham in Section 3116 was a controversial rewrite of longstanding nuclear waste policy, and the Senate Armed Services Committee (SASC) approved it via a legislative amendment offered by Senator Lindsey Graham with no opportunity for public debate or hearings in the committee of jurisdiction.

The fight began with a reported letter from Secretary of Energy Spencer Abraham to Rep. Dennis Hastert, the then-Speaker of the House of Representatives, following DOE’s loss in court.³⁶ While the letter requested a legislative solution, the House version of the NDAA featured no such language, either in committee or on the floor.³⁷ The Department’s letter asserted that it cannot continue cleanup of nuclear weapons production sites without the authority provided in Section 3116. This was not accurate. Four states, including South Carolina, addressed just this point in response to the original letter:

DOE’s recent statements to Congress appear to exaggerate the impacts of the recent judicial decision high-level waste classification. The federal court decision only confirmed long-standing national policy, which requires disposal of high-level waste in a geologic repository while allowing properly treated, less radioactive wastes to be disposed of elsewhere... What the court rejected was giving DOE free rein to override national policy as expressed in the Nuclear Waste Policy Act.³⁸

As initially introduced in March of 2004, the Senate version of the NDAA also contained no provision relating to the court’s decision.³⁹ Over the course of numerous days of hearings on the bill before its markup, the only Senator to raise the issue of HLW cleanup was Mr. Allard of

³⁶ *See Energy Dept. Seeks Power To Redefine Nuclear Waste*, Matthew L. Wald, Oct. 1, 2003, found online at <https://www.nytimes.com/2003/10/01/us/energy-dept-seeks-power-to-redefine-nuclear-waste.html>.

³⁷ *See* H.R.4200 - Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005 108th Congress, <https://www.congress.gov/bill/108th-congress/house-bill/4200/text/pcs>.

³⁸ *See also* the August 28, 2003 letter from the Attorneys General of Idaho, South Carolina, Oregon and Washington making precisely the same point, submitted as an attachment, Attachment B.

³⁹ *See* S.2229 - National Defense Authorization Act for Fiscal Year 2005, 108th Congress, <https://www.congress.gov/bill/108th-congress/senate-bill/2229/text>.

Colorado, partially in the context of the ongoing cleanup of the Rocky Flats nuclear weapons site in his state.⁴⁰

During the markup itself, which was closed to press, Sen. Graham offered and successfully added an amendment that essentially overturned a federal court ruling that DOE may not arbitrarily and unilaterally reclassify high-level radioactive waste and it provided DOE sole discretion to decide what is HLW in South Carolina and any other state with HLW. This amendment exempted DOE from any meaningful compliance with the Nuclear Waste Policy Act in South Carolina and effectively subverted two decades of congressional work, oversight and compromise on nuclear waste policy. Senator Carl Levin, the then-Ranking member of the Armed Services committee, noted during later (and the only) public debate that “this language was debated quite heatedly in our markup at committee. There were a couple of votes that were cast.”⁴¹ Thus, there is evidence that this language was just as controversial in the Armed Services committee markup as it turned out to be on the Senate floor, described below.

An additional provision was added in committee that denied hundreds of millions of dollars in necessary nuclear waste cleanup funding to other states that store HLW (Idaho and Washington) unless and until they agreed to allow DOE the same unilateral discretion to reclassify HLW as “waste incidental to reprocessing.”⁴² This, of course, was a transparent and explicit threat to necessary cleanup funding, pressuring those states to bend to DOE’s intention to reclassify HLW as the Department saw fit.

During Senate floor consideration of the bill, two amendments were raised regarding these two provisions. The first was Senate Amendment 3170, which amended Sec. 3119 in a way that Sen. Graham claimed was an offer of additional money from DOE rather than denying money to states that did not follow DOE’s reclassification plan.⁴³ Sen. Hollings, the other Senator from South Carolina, took the opportunity to discuss his recent awareness of the provision (having apparently not been informed by his fellow Senator from South Carolina) and his objections to it. Ultimately, this amendment was voice voted after a failed attempt to amend the amendment by Sen. Crapo of Idaho in order to “make it perfectly clear that there is no precedential effect of this language on any State of than South Carolina.” *Id.* Sen. Hollings objected to this; the text of this proposed alteration is not in the official records but its content may be reflected in the final language post-conference.

⁴⁰ See S. Hrg. 108-440, Pt. 1 & Pt. 7, Department of Defense Authorization For Appropriations For Fiscal Year 2005, Hearings Before The Committee on Armed Services, United States Senate, One Hundred Eighth Congress, Second Session On S. 2400, found online at <https://www.gpo.gov/fdsys/pkg/CHRG-108shrg93571/html/CHRG-108shrg93571.htm>; <https://www.gpo.gov/fdsys/pkg/CHRG-108shrg93577/html/CHRG-108shrg93577.htm>.

⁴¹ 150 Cong. Rec. S 6395, at S 6414, “Finally, this language was debated quite heatedly in our markup at committee. There were a couple of close votes that were cast. In my judgment, the Senate Armed Services Committee is not the place where we either should be amending the Nuclear Waste Policy Act or authorizing the Department of Energy to ignore the Nuclear Waste Policy Act. I, therefore, support the Cantwell amendment and hope that this Senate adopts the amendment.” <https://www.congress.gov/crec/2004/06/03/CREC-2004-06-03-pt1-PgS6395-2.pdf>.

⁴² See the Committee Print, Report No. 108-260, 108th Congress, 2nd Session, Sec. 3119 (at 390), S. 2400 as presented to full Senate, found online at <https://www.congress.gov/108/bills/s2400/BILLS-108s2400pcs.pdf>.

⁴³ See <https://www.congress.gov/amendment/108th-congress/senate-amendment/3170>; and <https://www.congress.gov/congressional-record/2004/05/20/senate-section/article/S5902-2>.

The second amendment was the far more contentious of the two and the one designed to halt this dramatic rewrite of nuclear waste law.⁴⁴ Senator Cantwell of Washington, the sponsor of this amendment, described it thusly:

whether we as a body want to change the Nuclear Waste Policy Act and redefine high-level waste as something other than waste that should be taken out of tanks in Savannah River, out of Washington State Hanford tanks to be stored in a permanent repository, or whether we are going to leave some of that in the tanks in the ground and have ground water continue to be contaminated.⁴⁵

Among Senator Cantwell's concerns were the jurisdictional problems of bypassing authority in the Energy & Natural Resources Committee and bypassing debate and hearings on the proposal within the committee of proper jurisdiction; she cited reporting on the troubling precedent that could be set with the initial language and concern from governors and others in the states about the effect this could have on their nuclear waste. Sen. Hollings, meanwhile, highlighted several potentially critical drafting issues and how they may affect states' rights, and noted attention from the editorial board of the New York Times that day calling the process of inserting this language "unacceptable." *Id.*

Senator Cantwell's amendment received several hours' worth of debate on the floor in total (limited by a procedural agreement) before ultimately failing in a 48-48 tie vote.⁴⁶ Despite this, in the House there remained no language on the issue and the House insisted on a conference regarding the various differences between the House and Senate versions.

The final conference agreement on the bill contained a heavily amended version of sections 3116 (and 3119, changed in number to 3117 in the final conference version). The final changes after weeks of controversy and rancor included covering only South Carolina and Idaho, letting the provision take precedence over only limited laws as opposed to "any other provision of law," and adding additional language to make clear that the amendment would have no effect on other states. The language of the conference report is precisely clear that the final language is limited in scope: "Section 3116 does not establish any precedent for and is not binding on the States of Washington, Oregon or any other state that is not a covered state for the management, storage, treatment, and disposition of radioactive and hazardous material."⁴⁷

⁴⁴ See 150 Cong. Rec. S6396 and number 3261, found online at <https://www.congress.gov/crec/2004/06/03/CREC-2004-06-03.pdf>, SA3261.

⁴⁵ 108 Cong. Rec. S6395-6421, found online at <https://www.congress.gov/congressional-record/2004/06/03/senate-section/article/S6395-2>.

⁴⁶ See 108th Congress, Senate Roll Call Vote 107, https://www.senate.gov/legislative/LIS/roll_call_lists/roll_call_vote_cfm.cfm?congress=108&session=2&vote=00107; see also, S. Rept. 108-260, National Defense Authorization Act For Fiscal Year 2005, <https://www.congress.gov/congressional-report/108th-congress/senate-report/260>.

⁴⁷ See H.Rept.108-767, H. Rept. 108-767, Ronald W. Reagan National Defense Authorization Act For Fiscal Year 2005, <https://www.congress.gov/congressional-report/108th-congress/house-report/767/1?overview=closed>, also online at <https://www.congress.gov/108/crpt/hrpt767/CRPT-108hrpt767.pdf>, at 353 and 883-885.

And thus, the law remains until this proposed reclassification of HLW by the Draft WIR Determination.⁴⁸

E. All Of This Activity Was The Subject Of Enormous Public Scrutiny

Along with sizable press coverage during the course of the litigation and immediately thereafter, the litigation and the legislative battle was also the subject of substantial press coverage, several law review and journal articles, including, but not limited to:

Wald, M, *Energy Department Is Challenged Over Waste Disposal Methods*, N.Y. TIMES, Mar. 4, 2002, available at <https://www.nytimes.com/2002/03/04/us/energy-dept-is-challenged-over-waste-disposal-methods.html>

News Release, Washington State Office of Attorney General, *Washington Seeks to Participate in Nuclear Waste Lawsuit Against D.O.E.*, July 16, 2002, available at <https://www.atg.wa.gov/news/news-releases/washington-seeks-participate-nuclear-waste-lawsuit-against-doe>

Clark, K., *Feds find shortcuts in nuclear cleanup*, High Country News, Nov. 11, 2002, available at <https://www.hcn.org/issues/238/13514>

NRDC, Press Release, *Court Rules Energy Department Reclassification of Nuclear Waste Illegal*, July 03, 2003, available at <https://www.nrdc.org/media/2003/030703>

Wald, M., *Judge Voids Cleanup Plan For Wastes At Bomb Plants*, NY Times, July 4, 2003, available at <https://www.nytimes.com/2003/07/04/us/judge-voids-cleanup-plan-for-wastes-at-bomb-plants.html>

TDN.com, *Corners can't be cut on cleanup at Hanford site*, Jul 9, 2003, available at https://tdn.com/news/opinion/editorial/corners-can-t-be-cut-on-cleanup-at-hanford-site/article_54f93023-86d8-5365-807c-92f0bafae1ad.html

Alvarez, R., *The Legacy of Hanford, Washington continues to evade responsibility for forty-seven years of contamination*, The Nation, July 31, 2003, available at <https://www.thenation.com/article/legacy-hanford/>.

⁴⁸ See e.g., the Transition Document on the NDAA FY 2005, "Additional information on the Section 3116 Waste Determinations: The Ronald Reagan National Defense Authorization Act of 2005 clarified DOE's authority to classify and dispose on-site some portion of tank waste as other than high-level waste. As discussed yesterday, the law is applicable to Savannah River and Idaho, but not Hanford; found online at https://www.energy.gov/sites/prod/files/maprod/documents/Transition_2008_2009_EM_Additional_Material_MA_Copy.pdf.

Alvarez, R., *To Clean or Not to Clean*, The Inlander, Aug. 7, 2003, available at <https://www.inlander.com/spokane/to-clean-or-not-to-clean/Content?oid=2175410>

News Release, Washington State Office of Attorney General, *Gregoire Opposes DOE Proposal to Change Nuclear Waste Laws*, Aug 29 2003, available at <https://www.atg.wa.gov/news/news-releases/gregoire-opposes-doe-proposal-change-nuclear-waste-laws>

Pegg, J.R., *House: Nuclear Waste Should Not Be Classified Less Hazardous*, Environmental News Service, Oct. 3, 2003, available at <http://www.ens-newswire.com/ens/oct2003/2003-10-03-11.asp>

Fryer, A., *Washington Lawmakers Stop Bush From Reclassifying Nuclear Waste*, SEATTLE TIMES, Oct. 3, 2003

Pope, C., *Nuclear waste changes sought at Hanford and other sites, New proposal would allow Energy Dept. to skip cleanup of the most lethal material*, Seattle Post-Intelligencer, May 5, 2004, available at <https://www.seattlepi.com/local/article/Nuclear-waste-changes-sought-at-Hanford-and-other-1144102.php>

Cantwell, M., *Sen. Cantwell's Floor Statement on Proposed Reclassification of Nuclear Waste*, May 20, 2004, available at <https://www.cantwell.senate.gov/news/press-releases/sen-cantwells-floor-statement-on-proposed-reclassification-of-nuclear-waste>

Struglinski, S., *Nuclear waste vote divides Nevada senators*, Las Vegas Sun, June 4, 2004, available at <https://lasvegassun.com/news/2004/jun/04/nuclear-waste-vote-divides-nevada-senators/>

Paskus, L., *Congress overrules the Courts*, High Country News, Feb. 16, 2004, available at <https://www.hcn.org/issues/268/14565>

Environmental News Network, *Energy Department pledges to remove 99 percent of nuclear waste from tanks*, 18 June 2004, available at <https://www.enn.com/articles/10046-energy-department-pledges-to-remove-99-percent-of-nuclear-waste-from-tanks>

Wald, M., *Bill Allows Atomic Waste to Remain in Tanks*, NY Times, OCT. 10, 2004, available at <https://www.nytimes.com/2004/10/10/politics/bill-allows-atomic-waste-to-remain-in-tanks.html>

West, S., *Sweeping the Mess Under Hanford's Rug: How the State of Washington and its Citizens Groups Plan to Clean it Up*, William & Mary Environmental Law and Policy Review, Volume 29 | Issue 3 Article 6, 2005.

David K. Mears & John Ruple, *Natural Resources Defense Council v. Abraham: Preventing the Department of Energy from Defining Away High-Level Nuclear Waste*, 24 J. Land Resources & Env'tl. L. 77 (2004).

Joanne Hughes Burkett, *Changing the Rules? NRDC v. Abraham & the Reclassification of High Level Nuclear Waste*, 12 Southeastern Env'tl. L.J. 159 (2004).

W. Chris Swett, POLITICS, MONEY, AND RADIOACTIVE WASTE: THE SAVANNAH RIVER SITE CONUNDRUM, 16 Southeastern Env'tl. L.J. 391 (2008).

Noah D. Lichtenstein, The Hanford Nuclear Waste Site: A Legacy of Risk, Cost, and Inefficiency, 44 Nat. Resources J. 809 (2004).

2004 NINTH CIRCUIT ENVIRONMENTAL REVIEW: CASE SUMMARIES, 35 Env'tl. L. 509, 571-572.

James D. Werner, *Toward Sustainable Radioactive Waste Control: Successes and Failures From 1992 to 2002*, 32 ELR 11059 (2002).

F. There Is No NEPA Coverage for the Draft WIR Determination

It should also go without saying that the National Environmental Policy Act, 42 U.S.C. §4321, et seq., provides no safe harbor for DOE's Draft WIR Determination. The Draft Determination is without a doubt a major federal action affecting the environment and there is no DOE NEPA document that specifically addresses the myriad of environmental harms attendant to this proposed decision to abandon waste in the HLW tanks. Nearly 8 years ago NRDC and HC addressed DOE's Department's Tank Closure and Waste Management Draft Environmental Impact Statement and we incorporate those comments here today.

But further, for DOE to proceed without any NEPA coverage at all of this explicit action (and to avoid segmenting the NEPA review, later and likely WIR Determination as a result of this action), is to avoid the fundamental requirement of NEPA, to search and subject to a "hard look" the *environmental impact comparison of reasonable alternatives* required under NEPA.⁴⁹ CEQ's regulations governing implementation of NEPA direct that Federal agencies "shall to the fullest extent possible....(b)...emphasize *real environmental issues and alternatives*...(e) Use the NEPA process to identify and assess the *reasonable alternatives to proposed actions that will avoid or minimize adverse effects of these actions* upon the quality of the human environment."⁵⁰ In setting out the fundamental purpose of an EIS, CEQ's regulations also state, "It [the EIS] shall provide full and fair discussion of significant environmental impacts and shall inform decisionmakers and the public of the *reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment*. Agencies shall focus on *significant environmental issues and alternatives*...."⁵¹ Satisfying these requirements is a non-discretionary duty of the NRC's NEPA process and obligations under the law.

⁴⁹ See NEPA, 42 U.S.C. §4321, et seq.; see also 40 C.F.R. §1502.14, 10 C.F.R. 51.85, and § 51.10-125 and App A.

⁵⁰ 40 C.F.R. §1500.2 (emphasis added).

⁵¹ 40 C.F.R. §1502.1 (emphasis added).

G. DOE's New Effort to Re-interpret HLW

More recently, DOE has recently issued a *Request for Public Comment on the U.S. Department of Energy Interpretation of High-Level Radioactive Waste*.⁵² In this notice, DOE requests comment on its interpretation of the definition of HLW, asserting that “[t]his statutory term indicates that not all wastes from the reprocessing of spent nuclear fuel (“reprocessing wastes”) are HLW, and DOE interprets the statutory term such that some reprocessing wastes may be classified as not HLW (non-HLW) and may be disposed of in accordance with their radiological characteristics.”⁵³ DOE explains the clear result of its newly suggested interpretation of the definition of HLW, stating:

Therefore, under DOE’s interpretation, *waste resulting from the reprocessing of SNF is non-HLW* if the waste: I. Does not exceed concentration limits for Class C low-level radioactive waste as set out in section 61.55 of title 10, Code of Federal Regulations; or II. Does not require disposal in a deep geologic repository and meets the performance objectives of a disposal facility *as demonstrated through a performance assessment conducted in accordance with applicable regulatory requirements*. Reprocessing waste meeting either I or II of the above is non-HLW, and may be classified and disposed in accordance with its radiological characteristics in an appropriate facility provided all applicable requirements of the disposal facility are met.⁵⁴

Thus, if DOE were to finalize its new interpretation of HLW, the Department could claim for itself the ability to simply declare HLW is no longer HLW, and therefore dispose of it differently—like in shallow land burial—and not in a deep geologic repository.

NRDC, et al. will respond accordingly and in a timely fashion to this notice, but we briefly note the following things about DOE’s newly suggested interpretation of HLW. First, such a new interpretation of statutorily defined term is contrary to law and exceeds the Department’s authority for many of the same reasons that this Draft WIR Determination would violate the law if finalized in its current form. We explain much of this below. Second, this notice seems a transparent attempt to garner the authority to reclassify HLW in the Area C tanks, but without necessarily even the public process and meeting the requirement that DOE ensure “the removal of key radionuclides to the maximum extent that is technically and economically practical before DOE can define waste as non-HLW.” *Id.* This self-serving effort to expand what is already DOE’s self-regulation with respect to how it manages HLW at its DOE nuclear weapons cleanup sites violates the NWPA and its clear requirement that HLW be defined by its source and origin.

This new interpretation is merely a proposal at this point and therefore can have no meaningful impact on DOE’s proposed action with respect to the reclassification of the Area C HLW tanks. Further, even if DOE were to attempt to conflate the two issues, such an effort will be sure to

⁵² 83 Fed. Reg. 50909, October 10, 2018.

⁵³ *Id.*

⁵⁴ *Id.* at 50911 (emphasis added).

draws both congressional and judicial scrutiny when and if the Trump Administration DOE attempts to move forward. Despite the DOE's assertions that "[a]t this time, DOE is not making—and has not made—any decisions on the disposal of any particular waste stream." *Id.*

In the parallel matter of this Draft WIR Determination, that is precisely what is happening. DOE goes on to suggest that it "will continue its current practice of managing all its reprocessing wastes as if they were HLW unless and until a specific waste is determined to be another category of waste based on detailed technical assessments of its characteristics and an evaluation of potential disposal pathways." That's essentially what it's doing in this Draft WIR Determination and for the reasons we articulate below, DOE has, again, run afoul of the law.

IV. DOE's 2018 Draft WIR Determination

DOE proposes leaving 62,900 gallons (about 500,000 Curies) of High-level radioactive waste in the sixteen C-Farm tanks at Hanford. C-Farm is one of eighteen such waste tank farms on the Hanford site. For a more complete description, see Dr. Kaltofen's Decl. at 5, 6.

A. The 16 tanks are HLW and are the result of reprocessing spent nuclear fuel

WMA-C received wastes created by the reprocessing of spent nuclear fuels, including Plutonium-Uranium Extraction Plant reactor fuel wastes and spent nuclear fuel fission wastes including strontium and cesium burned-fuel fission products.⁵⁵ This is most toxic and long-lasting waste in the world.

As was explained to the 9th Circuit in the original round of litigation years ago describing the reprocessing waste, the half-life (the time it takes for one-half of an unstable isotope of the element to be lost through radioactive decay) of some of the isotopes which have leaked are as follows: cesium-137, 30 years; strontium-90, 29 years; plutonium-239, 24,110 years; and uranium-238, about 4.5 billion years. A rule of thumb is that it in 10 times the half-life the amount of the isotope remaining is about 0.1 percent of its original value (i.e., almost entirely decayed away). Thus, it will take about 240,000 years before plutonium-239 has all but decayed away. By way of comparison, the civilization recognized by many historians to be among the oldest – the Mesopotamian – is understood to have begun less than 6,000 years ago. Kennewick Man walked near DOE's Hanford site on the "Columbia Plateau an estimated 8,340 to 9,200 years ago."⁵⁶ The last Lake Missoula flood that scoured eastern Washington and rerouted rivers at the end of the most recent Ice Age was only about 12,000 years ago.⁵⁷

B. The Draft WIR Determination is a technically unsound proposal

⁵⁵ See, e.g., Final Tank Closure & Waste Management Environmental Impact Statement, (DOE/EIS-0391), at Chapter 2; see also, DOE 2018 p. 48 to 51; see also, First and Second Declarations of Thomas Cochran, PhD., part of the record before the United States Federal District Court in Idaho in *NRDC v. Abraham*, 271 F.Supp.2d 1260 (D. Id. 2003), Attachments C and D.

⁵⁶ *Bonnichsen v United States*, 357 F.3d 962, 966 (9th Cir. 2004).

⁵⁷ Response Brief of Appellees Natural Resources Defense Council and Snake River Alliance at 8, n.6.

NRDC and Hanford Challenge contracted with Dr. Marco Kaltofen, of Boston Chemical Data Corp. to provide a technical analysis of DOE's Draft WIR Determination. See Attachment A, (hereinafter, "Kaltofen Decl. at ___"). Dr. Kaltofen describes in detail the technical history of the HLW in the tanks and its extraordinary radiotoxicity. Dr. Kaltofen writes:

In 1995, the Oak Ridge National Laboratory for DOE compiled estimates of radioactivity of the high-level wastes in storage at Hanford. The estimates are in units of MCi (Millions of Curies, a.k.a. equivalent to millions of grams of radium-226). These amounts have been reduced, in some cases by 15 to 20 percent due to radioactive decay, and by removals since 1995.

<i>Tank Wastes</i>		<i>Capsule Wastes</i>	
<u>Liquid</u>	<u>Solid</u>	<u>Strontium</u>	<u>Cesium</u>
68.5	123.3	44.9	101.2

[DOE, *Integrated Data Base Report-1995: U.S. Spent Nuclear Fuel and Radioactive Waste Inventories, Projections, and Characteristics*, DOE/RW-0006, Rev. 12, December 1996, p. 52.]

By comparison the annual limits on intake by ingestion for a radiation worker to ensure the workers dose does not exceed 5 rems per year is 0.0004 Ci of strontium-90 or 0.0001 curies ("Ci") of cesium-137. [EPA, *Limiting Values of Radionuclides Intake and Air Concentration and Dose Conversion Factors For Inhalation, Submersion, And Ingestion*, EPA-520/1-88-020, September 1988, pp. 49 and 71] Thus, the wastes at Hanford contain millions of "annual limits on intake" for nuclear workers. In its concentrated form the HLW in the tanks is chemically toxic in addition to being intensely radiotoxic. This is why Congress has required that all high-level radioactive waste be isolated in one or more deep geological repositories.

Kaltofen Decl. at 3.

Dr. Kaltofen also presents an abbreviated but on point history of the leaking HLW tanks and the projected plans for treatment, removal and vitrification of the HLW before disposal in a deep geologic repository. *Id.* at 3-4, 10.

Dr. Kaltofen raises a host of concerns with the Draft WIR Determination, and the declaration, filed this day, speaks for itself. But specific areas of concerns raised by Dr. Kaltofen include but are not limited to the following:

- (1) DOE rejects available (or foreseeable) technologies to remove the residual HLW from the tanks. The data do not even show that the limited tank-washing efforts have exhausted their utility; no further technologies have been explored.

(2) Without providing comparative alternatives risk data, DOE believes that abandoning wastes in the shallow subsurface creates less risk than removal, treatment, and use of a geological repository. The clear and documented uncertainties in DOE's analysis of the magnitude and timing of leaks from the residual abandoned HLW make it impossible to quantify the risk relative to removal of HLW from shallow burial.

(3) The consequences of abandoning waste to both public and environmental health and safety are ignored or minimized (see details in Part II). Comments by WA Ecology and data from US DOE's own analyses show that the residual HLW will exceed applicable legal standards before the expiration of the modeled 10,000 year period, and in fact, exceeds these legally-required quantitative levels already.

(4) Installing grout above the HLW will not isolate the waste for 10,000 years, but will guarantee that HLW eventually reaches the Columbia River. Migration from WMA C to the Columbia River could take as little as 10 years, even assuming that no accidental criticality is ever initiated.

(5) Abandonment and grouting will delay the achievement of legally-required cleanup milestones, rather than cause them to be met in a more timely fashion. It would be much more correct to say that the milestones had been moved rather than "reached."

Id. at 8, 9.

Dr. Kaltofen continues to write about the problematic and ill-advised nature of DOE's Draft WIR Determination, asserting,

Once grout fails in the tanks, any radioisotopes leached from the residual HLW left in tanks can move to the Columbia River in a relatively short time. The draft DOE WIR evaluation notes that, "Travel time of water through the unconfined aquifer from the 200 East Area to the Columbia River has been estimated to be in the range of 10 to 30 years" (US DOE 2018 sec. 2.1.5.3.3). Other estimates in the same reference suggest a maximum travel time of 33 years, based on reduced wastewater recharge in the 200 Areas. This is still only a small fraction of the already short design time of 1000 years before failure.

* * *

Hanford's radioisotope inventories have large uncertainties. The draft WIR evaluation notes that, "A previous assessment of limitations to the HDW model provided in HNF-3273, 'Hanford Defined Waste Model Limitations and Improvements,' showed that tank-specific HDW model estimates and tank sample results can vary by one to two orders of magnitude." These uncertainties apply to the materials discussed including TRU, technetium-99, iodine-129, zirconium-93, carbon-14, cesium-137, strontium-90; as well as isotopes not discussed specifically but present in the WMA C tanks such as isotopes of americium, neptunium, cobalt-60, europium, thorium, gadolinium, tritium, radium and others.

Uncertainty notwithstanding, there are more than 600 Curies of americium-241 and more than 17,000 Curies of cesium-137 estimated to be in WMA-C tanks according to the estimated inventories used in the PA (Some tanks have updated cesium-137 inventories due to retrieval operations. Post-retrieval samples showed that actual cesium-137 inventories were generally higher than the estimated inventories.) Included in these figures are 8.5 Curies of americium-241 and 187 Curies of cesium-137 in WMA C pipelines (2014 PA estimate). Given, however, that the actual supernatant to solids activity ratios of these isotopes is not fully known, the amount of these inventories to be abandoned is uncertain.

* * *

Leaving HLW near the surface of the ground at Hanford creates some unavoidable conflicts with the local environment. Shallow-buried materials lie in the portion of the soil where any groundwater percolates downward over time into the deeper, fully saturated, aquifer. This creates an obvious transport mechanism for any leached isotopes, including transuranic (heavier than uranium) isotopes of plutonium, americium and neptunium, that will eventually reach the Columbia River or potentially some other future groundwater user. (Most Americans rely at least in part on groundwater for drinking or agriculture).

* * *

The use of homogeneous groundwater models instead of multilayer heterogeneous modeling is insufficient to provide a realistic assessment of the time to breakthrough of residual tank wastes into the Columbia River. As noted in the draft WIR evaluation, "Hydraulic conductivity values reported for the aquifer in this area vary considerably, ranging from 0.04 (silt lenses within the sandy gravel) to 6,900 m/day." This is an unusually wide range of hydraulic conductivity values, and it demonstrates the heterogeneous nature of the aquifer. No known homogeneous hydrogeologic model can accommodate such a wide range of hydraulic

conductivities. The high hydraulic conductivity values are consistent with the short transit times for contaminants leaving the WMA C and arriving at the Columbia River. Given that HLW is already in the vadose zone and moving into the Columbia River, a more realistic multilayer heterogeneous groundwater model is required.

* * *

There is no evidence-based method for even estimating the potential failure rate of grouting based on failure to set due to waste chemistry. It is not feasible to pilot test a grouting treatment process facility that realistically simulates disposition of materials formerly classified as HLW. The actual chemistry of this processing is not known.

Id. at 16, 18, 22, 24.

Other technical comments by Dr. Kaltofen include the following:

Grouting Affects Retrieval: The failure to properly define the limits to technology means that HLW would be abandoned in place without employing additional technologies that could retrieve refractory solids in the WMA C tanks. Failure to remove the remaining HLW in the tanks makes it far more difficult to remove the tanks themselves. Tank recovery and removal is likely to be a key initial step to removing leaked HLW in the vadose zone below the tanks. Adding grout of course, only increases the difficulty of retrieval, potentially making HLW remediation from the vadose zone impossible.

* * *

Grout monolith longevity: Grout has never been tested under realistic conditions. DOE suggests that grout within the abandoned waste tanks is required to protect the environment from residual HLW for 1000 years (the “compliance period” vs. the sensitivity/uncertainty period of 10,000 years). The 1000-year time frame is of course, highly abbreviated compared to other analyses of waste migration performed at Hanford. DOE, in an act of self-regulation, created this specific time period in a DOE “order”. This shortened period of 1000 years does not meet the requirements of 40 CFR 191, which specifies a required period of 10,000 years (NRC 1995). The 2012 TC & WM EIS carries the grout leachate model past the year 4000 mark, when Columbia River activity levels for technetium-99 and iodine-129 would be reaching their equilibrium maxima.

Current models developed from empirical laboratory grout simulations cannot provide this kind of assurance for either 1000 years or 10,000 years. A 1995 PNL grout test at Hanford noted that (PNL 1995),

“The semi-infinite solid diffusion model was selected as the most

representative model for describing leaching of grouts. The use of this model with empirically derived leach constants yields conservative predictions of waste release rates, provided no significant changes occur in the grout leach processes over long time periods.”

The use of this model demands that the grout not only last for 1000 years, but that its properties must not change significantly over that entire period to remain protective. Certainly such a requirement is completely untested. The 1995 Hanford grout leaching tests ran on grouts that had set for 46 days, or 0.013 % of the required 1000 year-life of grouted HLW in WMA C tanks (or less than 0.004 % of the 4000 year climb toward the Columbia River equilibrium concentration, or 0.0013 % of the 40 CFR 191-required 10,000 years).

These same 1995 grout test reports noted (page 2.2) that any fracturing in the grout monolith formed in the abandoned tanks would invalidate the presumed groundwater velocity in grout of 0.5 to 5 cm per year. Normally groundwater would be expected to slowly diffuse through the grout monolith through a series of interconnected pores. This is the basis of the expected groundwater velocity of 0.5 to 5 cm per year. For example, the rate of groundwater flow in unfractured volcanic (igneous) rock is on the order of 0.002 cm per day and less. For fractured volcanic rock, groundwater can flow at a rate of 250 cm per day (Duffield citing Domenico & Schwartz 1990). This is a difference of nearly five orders of magnitude.

In effect, fracturing in grout due to temperature change, loading stress, imperfections in grout chemistry, ground subsidence, mechanical strain, or grout composition boundary (where anti-intrusion grouts and mechanical loading grouts meet); can cause an immediate catastrophic failure of the grout monolith in a tank. It is certainly possible that such a fracture could form during the initial pour and set of a grout lift during tank abandonment. This means that the grout would not survive a millennium; rather it would not even survive its first day in place.

Notably, a 1000-year grout life is still double the expected life of the WMA C surface barrier, which is designed to have a functional life of only 500 years. In contrast, the peak dose rate for all isotopes occurs at 1,500 years, and the peak radon flux from WMA C occurs at 10,000 years. That’s still better than the presumed life of institutional controls for Hanford, which is 100 years, or 10% of the expected grout life, or 1 % of the 10,000-year compliance period required by NUREG-1854.

* * *

Tank inventory: The total amounts of plutonium and other long-lived isotopes stored in Hanford’s 177 waste tanks are large. Technetium-99 is one of the most problematic isotopes at Hanford, because it is one of the most mobile radioisotopes once it reached groundwater. Its complex chemical behavior makes it difficult to immobilize in solid forms. It has a half-life of 211,000 years. The total amount of

technetium-99 in tanks is about 26,500 Curies (PNNL 2014). Of the total, 11,400 Curies was originally stored in the single shell tanks. Most of the double shell inventory is in the 200-E Area. If the waste tanks generally were allowed to become permanent repositories for the 4% abandoned HLW residual proposed by DOE for WMA-C, this would be 1,060 Curies of technetium-99 left in shallow burial at Hanford. This is in addition to the 652 Curies of technetium-99 already known to have reached Hanford sediments.

With the exception of the complexed pertechnetate species of technetium, the actual form of the up to 25% fraction of soluble technetium compounds is not known. This means that the mobility in grout monoliths or groundwater of this soluble technetium fraction is also not known. If 25% of the technetium is in the tank supernatant, this implies that any residual abandoned in the tanks will be relatively enriched in technetium, compared to the supernatants that will be treated via vitrification.

* * *

Accidental criticality: Nonradioactive chemicals play an important role in maintaining the safety of residual plutonium in tanks. Plutonium has a significant spontaneous fission rate, and a low critical mass. Critical mass is the minimum mass required to initiate a spontaneous nuclear criticality, which is very highly undesirable. Materials such as iron and cadmium maintain the plutonium in tank solids below the criticality safety limit (CSL) of 2 grams of plutonium per liter of waste solids (Westinghouse 1995). Actual maximum plutonium activity in the 100 and 200 series tanks is 0.35 to 0.70 g/L; up to 35 % of the CSL (Bratzel 1996, CSL also stated as 2.6 g Pu/L). Chemical washout from grout that removes cadmium or other neutron absorbers, or concentrates plutonium, can lead to unanticipated criticalities, which would create a catastrophic failure of containment.

Chemical crystallization at the grout-sediment interface is one example of a potentially plutonium-concentrating mechanism. The DOE WIR evaluation (US DOE 2018, p.55) notes that, "In most instances, adsorption appears to be the controlling geochemical process, but neutralization of acid waste by the alkaline sediment and neutralization of basic tank waste can cause precipitation of some contaminant species within the sediment pores." This means that plutonium leached from grout in the tanks would precipitate in the sediment pores immediately adjacent to the tanks, resulting in preferential deposition of plutonium. The grout solids, which serve to keep plutonium activity below the CSL, would be left behind. The WIR further notes on p. 55 that, "Outside the zone of pH neutralization, adsorption is considered to be the dominant retardation process in the vadose zone." This adsorption zone outside of the neutralization zone where plutonium can recrystallize would reinforce the tendency to concentrate plutonium residues in a small volume; again driving plutonium activity to reach or exceed the CSL, and encouraging the initiation of an accidental criticality.

In total, it is estimated that 500 to 1000 kg plutonium remains in the 100 and 200 series tanks (Ibid). In 1951 Hanford experienced an accidental criticality in a water solution of plutonium nitrate, where the system contained a total of 1.15 kg of plutonium-239 (LANL 1967). The laboratory building involved was never fully remediated, but was eventually abandoned. In comparison, tank C-102 is estimated to contain about 1.02 kg of plutonium-239 (2018 Oregon DOE data).

At Hanford, nonradioactive iron compounds in tank solids provide an important safety buffer against exceeding the CSL. However in some tanks, such as C-101, waste streams were disposed that had iron to plutonium-239 ratios of less than 5:1 (iron:plutonium-239). Differential loss of iron compounds would significantly impact the safety factor below the criticality safety limit for this waste solid in C-101.

On average in Hanford waste tanks, there are higher concentrations (on a molar basis) on plutonium in the solids versus the supernatant liquids in tanks. Tank C-110 has nearly a 100X greater plutonium concentration in solids compared to liquids. It is the solids left behind that will account for much of the abandoned residuals in tank wastes, meaning leaving a 4% residual of solids potentially leaves much more than 4% of a tank's plutonium in shallow burial. Tank liquids will be readily removed; most of these have plutonium concentrations between 10^{-6} and 10^{-9} molar. Tanks solids are most likely to be in the residual; these are 10^{-4} to 10^{-6} molar, with more than two orders of magnitude greater plutonium concentration.

Washington Dept. of Ecology commented on the criticality risks associated with DOE proposal, noting that DOE assumed that the single sample retrieved (from HLW tanks) might not be representative of the entire volume of residual waste. DOE stated that the C-200 tanks were presumed to have a similar history and waste types; yet, when sampled, there were considerable differences among some of these tanks. Given that result, WA DOE questioned the uncertainty associated with the use of waste type templates and how is it addressed in DOE's [plutonium] inventory estimates, given that these template values were derived from models (WA Ecology 2017).

* * *

TRU, technetium-99, iodine-129 and neptunium: The 2017 DOE Status Report (US DOE 2018b) states on p. 1-17, "The inventories of technetium-99 [technetium-99, half life of 211,000 years by beta decay] and iodine-129 [iodine-129, half life 15.7 million years by beta decay] as representative mobile constituents were used to evaluate potential impact of the PUREX tunnels." Nevertheless, the WIR neglected to address the large inventory of Tc-99 and other chemicals that reside beneath the tanks (<https://www.nap.edu/read/11618/chapter/8#63>). This also applies to wastes from other areas (such as the B-complex in the northwest corner

of the 200 East Area) where contaminants are now migrating into the WMA C area due to dissipation of the former groundwater mounds underneath effluent discharge points.

Prior US DOE documents (such as the 2012 Final Hanford Tank Closure and Waste Management Environmental Impact Statement, TC & WM EIS) note that the eventual long-term equilibrium activity of iodine-129 and technetium-99 in the Columbia River is a function of the percent removal of HLW from the tank farms (Sec. 3, DOE responses to public comments, TC & WM EIS).

The plans to abandon tank residuals containing these isotopes fails to consider that nuclides such as technetium-99 and iodine-129 exist at other waste sites on the Hanford Plateau. For example naval wastes disposed of at Hanford contain both nuclides, including 2.8 Curies of technetium-99 and a poorly characterized (but smaller) amount of iodine-129 (3/5/2010 letter from T. Mueller, Naval Systems Command to US DOE ORP).

WA Ecology (2017) noted that multiple individual monitoring wells for groundwater observation at Hanford contain these and other isotopes, along with hazardous chemical constituents. Some of these are outside of known major plume areas. These groundwater constituents, both radioactive and hazardous, would persist over and above those released from the abandoned waste tanks. Some monitoring wells, such as well 299-E27-155 at WMA C contain all three isotopes, technetium-99, iodine-129 and plutonium-239.

* * *

Summary:

- The long-term integrity of grout is untested.
- Grouting will not effectively bind residual HLW. Hanford's climatic and soil environments are particularly harsh for grout monoliths.
- Grout performance and the rate of groundwater flow through the grout monolith, is critically dependent on near-perfect, fracture-free, installation.
- The performance assessment does not use a reasonable time frame. Other sources of radioisotopes are not included in models. Models assume no significant decline in performance over time and no nonuniformity over space.
- Grouting of tank wastes is irreversible, preventing future remediation of residuals.
- Reasonably foreseeable future land uses that could affect groundwater hydraulic gradients and exposure scenarios are not addressed.
- Inadvertent criticalities are not addressed.
- Future use scenarios assume institutional controls or unrealistic land uses, such as no anthropogenic disturbance of a scale greater than drilling (e.g.

constructing building foundations). Climactic scenarios exclude dam failures, Columbia River flooding, concentrated rainfall events – especially in cooler weather, glacial flooding/damming.

Kaltofen Decl. at 11, 15-17, 19-20, 25-26.

C. State & Hanford Advisory Board Advice and Comments

The states of Oregon and Washington have identified how Department of Energy failed to meet its own standards for a WIR evaluation. To summarize, U.S. Department of Energy failed to show that it had removed key radionuclides, which the reclassified waste would be managed to meet performance standards, and that waste would be incorporated in a solid physical form. The State of Washington stated in its comments, "Ecology believes that the U.S. Department of Energy (USDOE) is unable to show compliance with the three criteria of the waste incidental to reprocessing evaluation process set forth in Chapter II of the Radioactive Waste Management Manual, DOE M 435.1-1." Oregon similarly identified U.S. DOE's failure to meet its own requirements. Both states object to U.S. DOE's decision to ignore contamination in soils near and below the tanks in Waste Management Area C. Additionally, both states argue that U.S. DOE's Performance Assessment is inadequate for supporting the WIR determination.

In addition to the observations of two states and Dr. Kaltofen about the technical issues related to the Draft WIR, the Hanford Advisory Board (HAB), a 32-member Site-Specific Advisory Board chartered under the Federal Advisory Committee Act, and set up by the DOE to provide advice on the Hanford cleanup to the DOE, has provided observations and official advice to the DOE on the issue of the Draft WIR. Hanford Challenge is a member of the HAB and participated in preparing this advice. We provide key sections of that advice verbatim below, and incorporate its points into our own comments:

“The relevant sections of DOE Order 435.1 permits waste reclassification if three separate requirements for wastes are met:

- **remove key radionuclides** to the maximum extent that is **technically and economically practical**;
- meet safety requirements comparable to the performance objectives set out in 10 CFR Part 61, Subpart C. Performance Objectives; and
- manage, pursuant to DOE's authority under the Atomic Energy Act of 1954, as amended, and in accordance with the provisions of Chapter IV of this Manual, provided the waste will be **incorporated in a solid physical form** at a concentration that does not exceed the applicable **concentration limits for Class C low-level waste** as set out in 10 CFR 61.55, Waste Classification; or will meet alternative requirements for waste classification and characterization as DOE may authorize (*emphasis added*).

The Draft WIR evaluation asserts that all three DOE Order 435.1 requirements have been met regarding the C-Farm tanks. However, the determination of whether key radionuclides have been removed to, "the maximum extent technically and economically practical" is one which is subject to challenge and seems to conflict with the intent of the Hanford Federal Facility Agreement and Consent Order, (TPA). One primary issue is determining how much waste may remain in tanks and what constitutes removal to the extent practical.

In its formal statement in the Tank Closure and Waste Management EIS (TCWMEIS), Washington State Department of Ecology (Ecology) stated that it interpreted the TPA and state and federal hazardous waste laws as requiring removal of 99% of waste in the tanks, prior to a determination of impracticality for further retrieval. Yet, DOE seeks to proceed with reclassifying waste after retrieving only 96% from the C Farm Tanks (some tanks have >9% residual remaining) and not retrieving any high-level key radionuclides from discharges to the soil.⁵⁸ This draft WIR would allow leaving 4% or approximately 60,000 to 70,000 gallons of High Level Nuclear Waste in the C-Farm tanks and would reclassify this waste form from high-level to low-level waste.⁵⁹ It should be noted that retrieval of bulk waste may not satisfy the criteria for removal of key radionuclides from the mixture of wastes to be disposed.

In the TCWMEIS, Ecology noted that the "preferred alternative" adopted by DOE was 99% retrieval; and, the TCWMEIS model predicted that leaving more waste resulted in levels of contamination that could exceed groundwater protection standards for thousands of years. The Board seeks clarification regarding whether DOE intends to use this WIR process to abrogate the formal Record of Decision under which DOE adopted the preferred alternative of 99% retrieval.

This draft WIR determination addresses only radionuclides remaining in the residual waste in the tanks and their auxiliary structures in WMA C. Because the residual waste is mixed waste (radioactive and hazardous), WMA C must also meet Washington State's dangerous waste requirements for closure.⁶⁰ Pursuant to the Tri-Party Agreement, closure plans must be approved by Ecology and incorporated into the Hanford Site-Wide Dangerous Waste Permit before DOE can proceed with closing the tanks.

Pertaining to the third WIR criterion, because DOE is not processing the residual waste in grout, but instead filling the tank void space with grout, the HAB is

⁵⁸ USDOE estimates that approximately 70,315 gallons of waste remain in the C Farm Tanks Tables 4-7, 4-8, with 5,500 gallons estimated remaining C-105 per USDOE June 18, 2018. There is a wide range of the amounts remaining in tanks with C-102 and C-112 having 20,500 gallons (6.5%) and 10,100 gallons (9.7%) respectively.

⁵⁹ Draft WIR Evaluation, Tables 4-7, 4-8, with 5,500 gallons estimated remaining C-105 per USDOE June 18, 2018.

⁶⁰ Washington Administrative Code (WAC) 173-303, *Dangerous Waste Regulations*.

concerned that the grout and waste will not be incorporated in a solid physical form as required by Order 435.1.

The WIR evaluation for WMA C only seeks to reclassify the tank infrastructure and residual wastes in tanks and pipelines. It does not include the high-level waste that leaked from the tanks or was spilled into the soil. In the process of learning about the draft WIR evaluation for WMA C, it has now emerged that, without any public notice, in 2008 DOE adopted a WIR determination to reclassify high-level nuclear wastes at Hanford which leaked or were spilled from tanks into soil during waste transfers and operations. This prior WIR determination followed the citation process under DOE O 435.1, which involves a less rigorous analysis than the evaluation process being pursued for the WMA C tank residuals. DOE has not yet provided a clear and consistent response regarding whether this previous WIR determination applies to the waste that leaked and spilled from the C Tank Farm, nor whether DOE ever intends to conduct a separate WIR evaluation for the WMA C contaminated soils.

Advice: Policy Basis

The [Hanford Advisory] Board advises that DOE:

- Ensure its WIR evaluation and the tank farm closure process includes the following steps:
 - Work with Ecology to establish a comprehensive process for tank closure that integrates closure standards and cumulative impacts. The Board is concerned that making piecemeal decisions using the WIR processes may never meet closure standards to allow for full consideration of cumulative impacts.
 - Integrate the closure standards in the C-Farm closure plan with the development of the WIR evaluation in order to address closure requirements as defined by Washington State Department of Ecology.
 - Include the soils beneath WMA-C in the current WIR evaluation.
- Initiate a demonstration test prior to grouting that affirms tank residual waste meets the requirements of concentration limits of Class C low-level as set out in 10CFR 61.55 and conforms to the exacting metrics of incorporation of waste into grout.
- Resolve how closure criteria established by the State of Washington are met when 9.7% of waste remains in a SST. DOE should provide clarification of the application of the TPA Appendix H & 1⁶¹ in the determination of that waste can remain in the

⁶¹ Hanford Federal Facility Agreement and Consent Order.

tanks.

Performance Assessment

The Board is concerned that the WIR is dependent on a Performance Assessment (PA) containing residual unmanaged uncertainties which may set a precedent for the closure of additional Hanford tank farms in the future.

At this point in time, the basis for the WIR evaluation rests mostly on the conclusions of the C-Farm PA which declares that all future seepage from C Farm residuals would be below drinking water standards for the next 10,000 years at specific monitoring points. The Board is concerned that the PA and the WIR fail to address the large inventory of Tc-99 and other contaminants of concern that moved laterally, in liquid form, through discharges from PUREX during processing years. The volumetric overload (millions of gallons) created a groundwater mound that accessed a stair-stepping gradient which transported Cobalt 60, Tc- 99, Cesium and Nitrate among other contaminants of concern, along silt lenses, sandwiched between other geologically discrete layers. The modeling report (Figure 30), by Stan Sobczyk, 12/1/16 illustrates those thin-layered ancient lake beds under C-Farm. Current modeling efforts for Unplanned Releases (UPRs) and tank leaks analyze only vertical transport through the vadose zone, even though there is firm evidence of lateral flow, of Co- 60, specifically, from C-Farm.

The C-Farm PA modeling has never accounted for liquid moving down slope from PUREX cribs towards C-Farm. Tank leaks and unplanned discharges may continue for many years. Additionally, the interaction of seepage from C-Farm or other nearby facilities with chemicals and radionuclides in the soil beneath C-Farm has not been considered. The tanks and the soil are inseparable as are the soils and groundwater. Groundwater remediation must be evaluated prior to a decision on tanks. DOE must address soil remediation, groundwater remediation and tank closure, in total, together (Composite Analysis).

The public was assured by Executive Assistant Secretary for EM, Ines Triay, that the PA would be vetted publicly, would be available for public comment and that DOE would share its response and decision(s) on the PA. The Board believes that the State of Washington and the public need adequate time to address the questions raised regarding the PA and have DOE resolve these questions prior to using the C-Farm PA to support the draft WIR evaluation.

Advice: Performance Assessment

The [Hanford Advisory] Board advises that DOE:

- Complete and update the Composite Analysis and address questions concerning the C-Farm PA prior to initiating the WTR evaluation and

C-Farm closure.

- Complete the PA Maintenance Plan before proceeding with a WIR determination. The Maintenance Plan is part of the long-term “decision package” for a WIR decision required by DOE Order 435.1 and should be open for public review and comment. The Board advises DOE to engage the Board and other stakeholders in the development of the PA Maintenance Plan, to ensure that follow-on monitoring and assessments adequately address public uncertainties and concerns about the adequacy of the existing PA model.
- Given that remaining uncertainties persist in the PA model, DOE should not use the model results as a basis to determine that no significant risk reduction would result from additional waste retrieval from the WMA C tanks and pipelines.

Cumulative Impact

In 2008, DOE executed a WIR determination for secondary wastes at Hanford, which included wastes that leak or spill from tanks into soil. This determination was developed and codified without knowledge of or participation by the Washington Department of Ecology, the original parties in the 2003 litigation, or the public. At the June 18, 2018 Public meeting for the WMA C WJR, a DOE Headquarters representative stated that the 2008 WIR was not intended to apply to past leaks, but to future leaks that occur during tank waste retrieval and treatment, however the language of the 2008 determination (last updated in 2017) does not include this specificity. DOE's current charge to the NRC is to review a WIR that excludes evaluation of the soils in Waste Management Area C.

WIR evaluations under 10 CFR 61.55 should include all media, including soils. Currently, with the transfer of HLW liquids out of the sixteen tanks, the highest impact from radionuclides and hazardous chemical in WMA C may now reside in the soil columns under those tanks. Past practices included over-filling of tanks, leaks as material went through the cascading system and out unsealed joints⁶² and because hoses were turned aside, and letting HLW liquid flow into the ground when tank space was at capacity and processing operations were deemed too important to stop.⁶³ Estimates are that 25,000 curies were leaked to the soil. The HAB questions the validity of a WIR process that excludes evaluation of radionuclide risks in the surrounding soil.

The Board is concerned that DOE's segmented approach does not consider the impacts from related decisions, such as DOE's stated intent to leave C-Farm soil contamination in place. A Composite Analysis is needed because the current approach does not evaluate or disclose the full range of impacts. The current

⁶² RPP.ENV 33418 Rev.1, M.E. Johnson, J.G. Field, CH2MHill Hanford Group, March 2008.

⁶³ WHC-MR-0227, April 1991, J.LWaite.

approach of each singular evaluation may result in a determination of low risk when in fact the total impacts may be significant. The Board questions the adequacy of utilization of the 2012 TWMCEIS to satisfy this requirement as Alternative 5 (the only EIS alternative that assumed less than 99% retrieval) shows that the groundwater maximum contamination limits will be exceeded at the Core Boundary. It seems to be insufficiently protective to meet the Order 435.1 requirements.

The Board is concerned that DOE has no plan to consider the cumulative impact of its related proposed actions/decisions to utilize the WIR process to both reclassify the high-level nuclear waste in C Farm Tanks and the waste discharged and leaked to soils.⁶⁴ National Environmental Policy Act (NEPA) and State Environmental Policy Act (SEPA) require the cumulative impact on human health to be considered, not just examining each individually to see if it meets DOE's standards. This applies to the chemical contamination releases as well as radionuclide releases. There is no consideration of those chemical releases and risk in the Draft WIR evaluation. The segmented approach of considering the risks from the related but separate DOE decisions may not meet the intent of NEPA or SEPA regulations. DOE has not laid out a public involvement process that will integrate still needed data for the PA into a comprehensive, site-wide closure vision.

Advice: Cumulative Impact

The [Hanford Advisory] Board advises that DOE:

- Enlarge the scope of the WIR evaluation to include the residual high-level nuclear waste in both C Farm Tanks and the surrounding soils which received historically documented liquid waste discharges.
- Ensure that the ability for future removal of the HLW in the vadose zone, under the tanks and throughout the geologic strata of WMA C is not inhibited by closure of HLW tanks.
- Integrate the Composite Analysis into the WIR decision. The Composite Analysis is a key part of the "decision package" for WMA C and should be available for public review prior to a final WIR determination for WMA C tanks and residuals.
- Provide the public with the ability to review what NEPA analysis has been done and alternatives to waste reclassification as part of meeting NEPA obligations during this comment period."⁶⁵

⁶⁴ USDOE's formally adopted plan guiding this WIR Evaluation for C Area states that USDOE-ORP has already issued a WIR by citation decision to reclassify the "soils contaminated by tank waste have already been classified as LLW by DOE-ORP using the WIR by citation process." RPP-Plan-47325 Rev. O (2010).

⁶⁵ Hanford Advisory Board, Advice Letter #229 (September 20, 2018), available at https://www.hanford.gov/files.cfm/299_WIR_Advice_9.20.18_2.0.pdf, pages 2-6.

V. The Draft WIR Determination is an unlawful proposal

With all the technical infirmities in the Draft WIR Determination that are identified above, there are no material factual issues genuinely in dispute. Rather, the matter DOE should consider before going forward is one of statutory interpretation. To wit, (1) Congress plainly stated that HLW is the highly radioactive material resulting from reprocessing spent nuclear fuel (and the rest of the definition of HLW under 42 U.S.C. § 10101(12)(A) is included for explanatory purposes); (2) Congress clearly intended that HLW be disposed of in a geologic repository pursuant to the NWPA without the need for human monitoring and maintenance; (3) the waste in DOE's HLW tanks, whether it is the 16 under consideration at Area C or any of the other 177, is HLW and thus, subject to the NWPA; (4) the incidental waste exemption, if finalized, would allow DOE to arbitrarily reclassify the HLW in the tanks so that the agency may avoid compliance with the NWPA; and (5) the incidental waste exemption is fundamentally inconsistent with the plain language of the NWPA and its overriding purpose of ensuring that HLW does not "adversely affect the public health and safety and the environment for this or future generations."⁶⁶

Even if Congress had not spoken clearly to the issue—which it did—this proposed agency action under Order 435.1 is not based on a permissible construction of the NWPA and Section 3116 (or no other existing provision of law) bars DOE from taking this action. Thus, this Draft WIR Determination also violates the Administrative Procedures Act (APA) by: (1) defying the clear congressional directive of the NWPA; (2) being based on an administrative record that is devoid of support for DOE's actions⁶⁷; and (3) reversing longstanding agency policy without reasoned explanation.

Under Order 435.1's incidental waste exemption, DOE awards itself the unilateral authority to reclassify the HLW in the tanks as incidental waste and thus abandon that waste in place rather than in a geologic repository. Ostensibly no longer HLW, this waste is not subject to the requirements of the NWPA and may be disposed of under the substantially less strict requirements applicable to low-level waste. Rather than dispose of HLW in a geologic repository, DOE will begin, at Hanford, to abandon thousands of gallons of highly radioactive sediments and sludges in the bottom of the underground tanks, cover the waste in place with concrete, and hope (or not care that) the tanks will not cause an environmental and public health catastrophe immediately or in the future.

Fundamentally, DOE's proposed action creates a new national sacrifice zone for HLW. Disposal of tens of thousands of gallons of HLW in Washington will (1) result in a potentially catastrophic dispersal of radioactivity into the environment and (2) at a minimum, require significant land-use restrictions, maintenance, and monitoring in perpetuity. (Kaltofen Declaration, at 25-26.) Both of these results are contrary to law.

⁶⁶ 42 U.S.C. §10131(a)(7).

⁶⁷ For more on an administrative record that is devoid of support for DOE's actions, see attached declaration of Marco Kaltofen, Attachment A.

For the NRDC, HC and CR, and the public, the impact of abandoning HLW at these sites is profound. For example, the Yakama Tribe, a culture that long pre-dates the United States, has been centered on the health of the Columbia River and its natural resources for thousands of years. The continued survival of that culture depends upon the vitality of the Columbia River and thus, on decisions made in this case. For the Yakamas, it is simply anathema to consider as an appropriate solution the abandonment of HLW that will eventually leak into the river.⁶⁸

A. Statutory Definition of HLW

The NWSA was passed in 1982 when Congress recognized the growing need to identify a safe means of disposing of HLW derived from reprocessing fuel and target materials irradiated in military production reactors, research and test reactors and commercial power reactors.⁶⁹

In passing the NWSA, Congress limited its consideration of long-term disposal of HLW to a deep geologic repository. The reasoning is self-evident in the legislative history of the NWSA:

The Committee strongly recommends that the focus of the Federal waste management program remain, as it is today, on the development of facilities for disposal of high-level nuclear waste *which do not rely on human monitoring and maintenance to keep the waste from entering the biosphere. As has been emphasized and reiterated over the lifetime of the federal nuclear program, high level wastes should not be a burden on future generations.*⁷⁰

With the principle of unmonitored long-term isolation in mind, Congress established elaborate mechanisms for identifying and siting repositories, research and development, environmental review, and extensive and involved public and inter-governmental processes to obtain final agreement on siting a HLW repository.⁷¹

The process of identifying and evaluating a repository site involves oversight and implementation by three federal agencies: the Nuclear Regulatory Commission (“NRC”), DOE, and the Environmental Protection Agency (“EPA”), as well as requirements for the President to nominate (originally) three sites and to receive congressional endorsement of one of the sites, which the affected state or Indian tribe could challenge. These myriad procedures and evaluations were put in place because of the magnitude of the risks involved, because of Congress’s interest in ensuring that repositories are safe, and because of the substantial public concern about HLW. *See* House Report at 26-31.

In setting out the disposal requirements of high-level radioactive waste, Congress defined the term. “High-level radioactive waste” is:

⁶⁸ See the Comments submitted this day by the Confederated Tribes and Bands of the Yakama Nation.

⁶⁹ House Report at 26-30; *see also* *Natural Resources Defense Council, Inc. v. Environmental Protection Agency*, 824 F.2d 1258, 1262 (1st Cir. 1987).

⁷⁰ House Report at 29 (emphasis added).

⁷¹ *See* NWSA, 42 U.S.C. §§ 10101 *et seq.*

- (A) *the highly radioactive material resulting from the reprocessing of spent nuclear fuel*, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and
- (B) other highly radioactive material that the [Nuclear Regulatory] Commission, consistent with existing law, determines by rule requires permanent isolation.⁷²

Thus, the NWSA defines HLW by its source – “material resulting from reprocessing.” DOE defines reprocessing as a process for extracting uranium, plutonium, and other radionuclides from dissolved spent nuclear fuel and irradiated targets. The fission products that are left behind are HLW.⁷³ Reprocessing waste is categorically treated as HLW because it is necessarily both “intensely radioactive and long-lived.”⁷⁴

Congress has authorized that the HLW defined under the NWSA be disposed of only at a geologic repository and that Yucca Mountain in Nevada be the site considered.⁷⁵

B. Storage and Management of HLW

NRDC et al and DOE agree that 100 million gallons of HLW generated by DOE’s nuclear fuel reprocessing is stored at DOE sites in more than 200 steel tanks buried just below the surface of the earth.⁷⁶ These tanks range in size from a few hundred thousand gallons to more than 1 million gallons.⁷⁷ This waste is primarily divided among three main production sites: Hanford, which has 177 tanks storing more than 56 million gallons of HLW⁷⁸; SRS, which has 51 tanks storing approximately 40 million gallons of HLW; and INEEL, which has 11 tanks storing about 900,000 gallons of HLW.

Dozens of these storage tanks have leaked HLW.⁷⁹ Radioactive elements that have leaked out include cesium, strontium, tritium, technetium, iodine, plutonium and uranium. Some of these

⁷² 42 U.S.C. 10101(12) (emphasis and text in brackets added). “Fission products” are radioactive isotopes (*e.g.*, strontium-90, cesium-137, technetium-99) that are produced when uranium or other fissionable atoms split (“fission”) in nuclear reactions. Cochran Decl. at 5-6; *see also* Complaint, Attachment E, *Hanford Tank Waste Remediation System, Final Environmental Impact Statement* (“EIS”) (August 1996) where DOE acknowledges that HLW solids in the tanks include slurry, sludges, and salt cake.

⁷³ U.S. Department of Energy Office of Environmental Management, Linking Legacies: Connecting the Cold War Nuclear Weapons Production Processes to Their Environmental Consequences (January 1997), at 221.

⁷⁴ *See* 52 Fed. Reg. 5994.

⁷⁵ 42 U.S.C. §§ 10107(b)(2) and 10172. The legal and technical adequacy of the Yucca Mountain facility is irrelevant to the subject of this dispute.

⁷⁶ *See* Attachment E, District Court Complaint at 2, ¶2; DOE Answer at 2, ¶2.

⁷⁷ Complaint, Attachment E, *DOE Final Waste Management Programmatic EIS*, Vol. 1, 9-3 to 9-7 (1997).

⁷⁸ There is more HLW at Hanford than in the tanks. HLW waste was dumped or spilled to the soils throughout Hanford’s operational history, including an estimated 120 million gallons dumped to the B/C Cribs at Hanford, and up to 1.5 million gallons that inadvertently leaked out of existing tanks. As previously cited, Hanford generated 525 million gallons of HLW.

⁷⁹ GAO/RCED-98080, “Nuclear Waste - Understanding of Waste Migration at Hanford is Inadequate for Key Decisions,” at 5, March 1998 (available at <http://www.gao.gov>). The 1998 GAO report notes that these amounts do not include recent estimates using a new approach that found that radioactive leaks could be much higher on some tanks, nor does it include the radioactive wastes lost due to surface spills and leaks in pipelines. *Id.* at n.2.

materials remain radioactive for hundreds of thousands of years. Non-radioactive but hazardous materials that have leaked include nitrates and metals such as chromium.

If the incidental waste exemption of Order 435.1 is implemented at these 16 tanks at Area C, thousands of gallons of HLW will be abandoned.⁸⁰ Indeed, the concentration of radioactivity in the abandoned sludges and sediments can be as high, or even higher, than the concentration of radioactivity in the materials removed from the tank after DOE implements the incidental waste exemption of Order 435.1 and cover the remaining waste and tanks in concrete.⁸¹

For all the reasons described above and in the background and historical section, DOE's Draft WIR Determination would violate current law in several ways:

1. The Draft WIR Determination would, finalized, let DOE exempt from the definition of "high-level radioactive waste" wastes that are now, and always have been, commonly understood to be "high-level radioactive waste."
2. The Draft WIR Determination would give DOE, rather than the Nuclear Regulatory Commission, the power to decide ("subject to the whim of DOE," as the district court said) what constitutes "high-level radioactive waste," and therefore how it will be managed.
3. The Draft WIR Determination replaces the NWPAs "fission products in sufficient concentrations" standard, which is based on risk to the public health and safety, with a "practical" standard, which is based on the Department's judgment on whether it is (in the district court's words) "too expensive or too difficult."
4. The Draft WIR Determination exempts the many thousands of gallons (62,900) and about 500,000 curies of high-level radioactive waste in Hanford's Area C from regulation as HLW by the Nuclear Regulatory Commission, repealing—as applied to these wastes—a statutory requirement that has existed since 1974.
5. The Draft WIR Determination exempts the remaining HLW in these 16 tanks from disposal in a deep geologic repository under the Nuclear Waste Policy Act.

DOE will violate the NWPAs and the APA if it finalizes the Draft WIR Determination, which specifically allows it to reclassify HLW and call it "incidental waste" or "waste incidental to reprocessing" ("WIR") and manage it as low-level radioactive waste.⁸² This renaming process would allow DOE to permanently leave HLW—which will eventually disperse into the

⁸⁰ See Kaltofen Decl., at 11.

⁸¹ See Complaint, Attachment E, at 8 (NRC Review of SRS HLW Tank Closure Methodology, June 30, 2000), where the NRC states that key radionuclides cannot be removed preferentially from the bottom of the tanks.

⁸² See "The purpose of this Draft WIR Evaluation is to assess and document whether the residuals, waste tanks, and ancillary structures at closure of WMA C meet DOE M 435.1-1 criteria (which are discussed in Section 3 and addressed in detail in Sections 4, 5, and 6, respectively), and may be determined to be incidental to reprocessing, not HLW, and managed as LLW." Draft WIR Determination at 1-5 (citations omitted).

environment—in shallow land burial in at least 16 storage tanks located at a DOE nuclear weapons site, the Hanford Reservation in Washington near the Columbia River.

As was true in 2003 and 2004 when many of these same entities were before the Federal District Court in Idaho, there are no material factual issues genuinely in dispute. The following things are true and require DOE to withdraw this Draft WIR Determination. First, Congress plainly stated that HLW is the highly radioactive material resulting from reprocessing spent nuclear fuel and the rest of the definition of HLW under 42 U.S.C. § 10101(12)(A) is included for explanatory purposes that in no way excuse or allow for DOE's actions, or DOE would have prevailed on the merits nearly 15 years ago, which they did not. Second, Section 3116 of the 2005 NDAA, which does allow for DOE to reclassify waste at SRS and INEL provides the Department no recourse, which it acknowledges. Third, Congress clearly intended that HLW be disposed of in a geologic repository pursuant to the NWPA without the need for human monitoring and maintenance.⁸³ Fourth, the waste in DOE's tanks – in Area C and the rest of the Hanford tanks, is HLW and thus, subject to the NWPA. Thus, the Draft WIR Determination would allow DOE to arbitrarily reclassify the HLW in the tanks so that the agency may avoid compliance with the NWPA and is, therefore, fundamentally inconsistent with the plain language of the NWPA and its overriding purpose of ensuring that HLW does not “adversely affect the public health and safety and the environment for this or future generations.” 42 U.S.C. §10131(a)(7).

It is also clear that even if Congress had not spoken clearly to the issue – which it did – the Draft WIR Determination is not based on a permissible construction of the NWPA. Last, DOE should be aware that the Draft WIR Determination violates the APA by: (1) defying the clear congressional directive of both the NWPA and Section 3116; (2) is based on an administrative record that is, along with its legal infirmities, chock full of holes in its technical presentation in trying to suggest that HLW in the 16 tanks can be treated as LLW; and (3) reversing longstanding agency policy without reasoned explanation.

Simply, with this Draft WIR Determination, as it tried in 2004 and where it failed in gaining in this authority in Washington, DOE has awarded itself the unilateral authority to reclassify the HLW in the tanks as incidental waste and thus abandon that waste in place rather than in a geologic repository. Ostensibly no longer HLW, this waste is not subject to the requirements of the NWPA and may be disposed of under the substantially less strict requirements applicable to low-level waste. Rather than dispose of HLW in a geologic repository, DOE will abandon literally thousands of gallons of highly radioactive sediments and sludges in the bottom of the underground tanks, cover the waste in place with concrete, and hope the tanks will not cause an environmental and public health catastrophe. The waste remaining in the tanks – not just in C Farms at Hanford but in later WIR Determinations that are sure to follow – will have comparable – and potentially much higher – concentrations of radioactive elements than the HLW removed from the tanks for disposal in a geologic repository. The ripeness concerns that halted the litigation in the 9th Circuit are addressed by this action.

⁸³ 42 U.S.C. § 10101(9) (emphasis added); *see also* the discussion above of the decades of scientific agreement on the need to dispose of reprocessing waste in a geologic repository.

Fundamentally, DOE's proposed action here creates another national sacrifice zone for HLW. Disposal of tens of thousands of gallons of HLW in Washington will (1) result in a potentially catastrophic dispersal of radioactivity into the environment and (2) at a minimum, require significant land-use restrictions, maintenance, and monitoring in perpetuity. Both of these results are contrary to law.

For NRDC, HC, CR, and the rest of the affected public, the impact of abandoning HLW is profound. For example, the Yakama Tribe, a culture that long pre-dates the United States, has been centered on the health of the Columbia River and its natural resources for thousands of years. The continued survival of that culture depends upon the vitality of the Columbia River and thus, on decisions made here. For the Yakamas, it is simply anathema to consider as an appropriate solution the abandonment of HLW that will eventually leak into the river.

Thus, DOE should withdraw the Draft Waste Incidental to Reprocessing Evaluation for Closure of Waste Management Area C at the Hanford Site, Washington.

C. The Legal Standards DOE's Draft WIR Determination Ignores

This is, as an initial matter, one of statutory interpretation. It is axiomatic that "[t]he task of resolving [a] dispute over the meaning of [a statute] begins where all such inquiries must begin: with the language of the statute itself." *United States v. Ron Pair Enters, Inc.*, 489 U.S. 235, 241 (1989). Where statutory language inquiry reveals plain language, "the sole function of the courts is to enforce it according to its terms." *Id.* (quoting *Caminetti v. United States*, 242 U.S. 470, 485 (1917)). A "[court] need not defer [to an agency if it] can ascertain congressional intent using the traditional tools of statutory construction." *Ortiz v. Meissner*, 179 F.3d 718, 723 (9th Cir. 1999) (citing *INS v. Cardoza-Fonseca*, 480 U.S. 421, 446 (1987)); see also *California Energy Comm'n v. Bonneville Power Admin.*, 909 F.2d 1298, 1306 (9th Cir. 1990). The factual elements of this matter are technical in nature, but there is no genuine dispute about those elements.

DOE has generated approximately hundreds of millions of gallons of HLW by reprocessing spent nuclear fuel, with some 100 million gallons of extraordinarily dangerous HLW stored in tanks in Idaho, South Carolina, and Washington. This precise set of comments addresses 16 tanks at Area C in Washington. Congress addressed this situation directly.

In response to the massive amounts of HLW at defense facilities (and spent nuclear fuel at commercial facilities), Congress directed that HLW (and commercial spent fuel) be disposed of in a deep, geologic repository, constructed and regulated pursuant to the NWPA. The definition of HLW under the NWPA is plain ("the highly radioactive material resulting from the reprocessing of spent nuclear fuel"), and even contains two illustrations of HLW ("liquid waste produced directly in reprocessing" and "solid material derived from such waste with fission products in sufficient concentration"). In short, the waste in the tanks is defense-generated HLW, *i.e.*, highly radioactive material resulting from the reprocessing of spent nuclear fuel, and is thus subject to the NWPA. The Draft WIR Determination allows DOEs to arbitrarily reclassify the HLW in those 16 tanks so that the agency may avoid compliance with the NWPA and abandon

the waste in place under less protective standards. Under well-established tenets of statutory interpretation such action cannot stand.

Even though a plain reading of the NWPA should end the matter, the Draft WIR Determination violates the APA by: (1) defying the clear congressional directive of the NWPA; (2) being based on an Administrative Record that is without support DOE's actions; and (3) reversing longstanding agency policy without reasoned explanation.

D. The Draft WIR Determination Violates the Plain Language Of The Nuclear Waste Policy Act

The two-step framework articulated in *Chevron U.S.A., Inc. v. Natural Resources Defense Council, Inc.*, 467 U.S. 837, 842-843 (1984), requires that courts are “the final authority on issues of statutory construction and will reject administrative constructions which are contrary to clear congressional intent.”⁸⁴ “First, always, is the question whether Congress has directly spoken to the precise question at issue. If the intent of Congress is clear, that is the end of the matter”⁸⁵ Second, if there is some question as to Congress's intent, the agency's interpretation must be “based on a permissible construction of the statute.”⁸⁶

The legality of the Draft WIR Determination is a plain language matter—*Chevron* Step 1. Congress directly spoke to the issue before the Court and that should be the end of the matter.

1. Congress Plainly States That HLW Is The Highly Radioactive Material Resulting From The Reprocessing Of Spent Nuclear Fuel

Congress is clear. HLW is:

(A) *the highly radioactive material resulting from the reprocessing of spent nuclear fuel*, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and

(B) other highly radioactive material that the Commission [NRC], consistent with existing law, determines by rule requires permanent isolation.⁸⁷

⁸⁴ *American Rivers v. Federal Energy Regulatory Comm'n*, 201 F.3d 1186, 1194 (9th Cir. 2000) (quoting *Natural Resources Defense Council, Inc. v. United States Dep't of Interior*, 113 F.3d 1121, 1124 (9th Cir. 1997) (citing *Chevron*, 467 U.S. at 843 n.9) (internal quotations omitted)).

⁸⁵ *American Rivers*, 201 F.3d at 1194 (quoting *Chevron*, 467 U.S. at 842-3); accord *Rainsong Co. v. Federal Energy Regulatory Comm'n*, 106 F.3d 269, 272 (9th Cir. 1997).

⁸⁶ *Chevron*, 467 U.S. at 843.

⁸⁷ 42 U.S.C. 10101(12) (emphasis added). “Fission products” are radioactive elements, see n. 4. It should also be noted that the AEA has specifically adopted the definitions of “high-level radioactive waste” and “spent nuclear fuel” included in the NWPA. 42 U.S.C. § 2014(dd).

Thus, the NWPA defines HLW by its source—“the highly radioactive material resulting from the reprocessing of spent nuclear fuel”—rather than its hazardous characteristics. Reprocessing waste is categorically treated as HLW and defined by its origin because it is necessarily both “intensely radioactive and long-lived.”⁸⁸ Reprocessing is the act of separating the ingredients in irradiated nuclear reactor fuel and target materials into constituent parts or streams.⁸⁹ The extraordinarily radioactive waste that results from this process is HLW.⁹⁰

The language that follows the word “including” in subsection (A) in the HLW definition is there for illustrative purposes. Under traditional rules of statutory construction, the term “including” is not one of all-embracing definition, but connotes simply an illustrative application of the general principle.⁹¹ Congress’s general principle is that HLW is defined by its source. Therefore, Congress is clear that HLW is all highly radioactive material resulting from the reprocessing of spent nuclear fuel.

In subsection (B) of the HLW definition, Congress provides the NRC with the authority to determine via rulemaking that “other” highly radioactive material (*i.e.*, highly radioactive material that *may not be* the result of the reprocessing of spent nuclear fuel) requires permanent isolation (*i.e.*, should be disposed of in a repository pursuant to the NWPA). Subsection (B) of the HLW definition is irrelevant as DOE is not subjecting this Draft HLW Determination to the regulatory authority of the NRC.

2. Congress Plainly States That HLW Is To Be Disposed Of In A Deep, Geologic Repository Pursuant To The NWPA

The intent of Congress with respect to HLW is plain. HLW from the reprocessing of spent nuclear fuel is to be disposed of in a deep, geologic repository constructed and regulated pursuant to the NWPA.⁹²

Congress defined the term “disposal” in plain language: “[T]he emplacement *in a repository* of HLW, spent nuclear fuel, or other highly radioactive material *with no foreseeable intent of*

⁸⁸ See 52 Fed. Reg. 5994. For purposes of explanation, Dr. Cochran describes both the nature of reprocessing and the resulting HLW. Cochran Decl. at 5-7.

⁸⁹ *Id.*

⁹⁰ *Id.*

⁹¹ *Public Citizen, Inc. v. Lew*, 127 F.Supp.2d 1 (D.D.C. 2000) (*citing Fed. Land Bank v. Bismarck Lumber Co.*, 314 U.S. 95, 100 (1941)). See also, *F.T.C. v. MTK Marketing, Inc.*, 149 F.3d 1036, 1040 (9th Cir. 1998), *cert. denied*, *Frontier Pacific Ins. Co. v. F.T.C.*, 119 S.Ct. 1028 (1999) (“In terms of statutory construction, use of the word ‘includes’ does not connote limitation; in definitive provisions of statutes and other writings, ‘include’ is frequently, if not generally, used as a word of extension or enlargement rather than as one of limitation or enumeration.”); and *U.S. v. Gertz*, 249 F.2d 662, 666 (9th Cir. 1957) (“The word ‘includes’ is generally a term of enlargement and not of limitation, and ‘including’ is not one of all embracing definition, but connotes an illustrative application of the general principle.) (citations omitted).

⁹² 42 U.S.C. § 10107(b)(2); see also August 2002 Decision at 11 (“Unless the President finds otherwise, defense high-level waste must be disposed of in civilian repositories established by the NWPA.”)

*discovery...*⁹³ In case there is any doubt, the NWPA's legislative history displays Congress's intent that HLW should be as isolated as possible from humans and their natural environment pursuant to the NWPA. Congress wrote:

The Committee strongly recommends that the focus of the Federal waste management program remain, as it is today, on the development of facilities for disposal of high-level nuclear waste *which do not rely on human monitoring and maintenance to keep the waste from entering the biosphere. As has been emphasized and reiterated over the lifetime of the federal nuclear program, high level wastes should not be a burden on future generations.*⁹⁴

3. The Waste In DOE's Area C Tanks Is HLW That Is Subject To The NWPA

DOE has long acknowledged that they have generated 100 million gallons of HLW and placed that waste in huge, underground storage tanks at SRS, INEEL, and at the Hanford Nuclear Reservation in Washington. *See* Complaint at 2, ¶2; Answer at 2, ¶2.⁹⁵ At no point until this Draft WIR Determination has DOE suggested the waste in Area C is not HLW. Indeed, DOE spent decades analyzing and managing the HLW in the tanks, as evidenced by publications such as the *SRS High-Level Waste Tank Closure Draft Environmental Impact Statement* (November 2000). *See* Complaint Att. 7, title page and excerpt.⁹⁶ The waste planned for abandonment in the 16 Area C tanks is, by plain statutory definition, and by DOE's long admission and acknowledgement, HLW. The clear intent of Congress should be given effect. *Chevron*, 467 U.S. at 842-3; *accord Rainsong Co.*, 106 F.3d at 272. Thus, DOE's HLW must be disposed of in a deep, geologic repository constructed and regulated pursuant to the NWPA. 42 U.S.C. § 10107(b)(2); *see also* August 2002 Decision at 11 ("Unless the President finds otherwise, defense high-level waste must be disposed of in civilian repositories established by the NWPA.").

4. Section 3116 Provides No Exception for the Area C HLW Tanks

There is an exception to the rule that HLW must be disposed of in a repository, but is unavailing in this instance. Section 3116, discussed above, spelled out criteria for the Energy Secretary to determine that the HLW can be reclassified as incidental waste (and thus can be disposed of on-

⁹³ 42 U.S.C. § 10101(9) (emphasis added); *see also* the discussion above of the decades of scientific agreement on the need to dispose of reprocessing waste in a geologic repository.

⁹⁴ House Report at 29 (emphasis added).

⁹⁵ In the Order 435.1 litigation that took place nearly 16 years ago, Plaintiffs wrote in the first sentence of paragraph 2 of their Complaint, "[t]he DOE and its predecessors ... generated approximately 100 million gallons of high-level radioactive waste." Complaint at 2, ¶2. DOEs wrote "DOEs admit the allegations in the first sentence of paragraph 2 except to aver that 'ERDA' was the Energy Research and Development Administration." Answer at 2, ¶2. Also, two Hanford tanks were determined not to contain reprocessing waste. 58 Fed. Reg. 13342.

⁹⁶ DOE still refers to the tanks as the "HLW tanks." A Final Environmental Impact Statement was published decades ago and carries the name *High-Level Waste Tank Closure EIS*. (DOE May 2002).

site and in place) via amendments that provided DOE with authority to reclassify HLW as “waste incidental to reprocessing.” Therefore, under this law, DOE can dispose of this reclassified HLW according to requirements other than those specified by NWPA (*ie.*, the HLW will no longer have to be disposed of in a geologic repository and can be disposed of according to standards and performance objectives applicable to low-level radioactive waste (LLW)).

But the law restricted this activity to South Carolina and Idaho. The law states in pertinent part: “COVERED STATES.—For purposes of this section, the following States are covered States: (1) The State of South Carolina. (2) The State of Idaho.”⁹⁷

Under those criteria, in SC and ID only, DOE may reclassify as “incidental” waste that exceeds the performance objectives for the disposal of low-level radioactive waste, 10 C.F.R. §61.40 (*i.e.*, waste that is not actually low-level waste), so long as it has (1) removed highly radioactive radionuclides “to the maximum extent practical” and (2) has obtained a state issued permit, authority for the issuance of which is conferred on the State outside of Section 3116. At SRS, pursuant to this authority, DOE “determined” that certain HLW in the underground tanks is “incidental” waste.⁹⁸ More generally, provision means that the NWPA means that the Energy Secretary has the powers outlined in Section 3116(a) in Idaho and South Carolina, but not in the rest of the country. As a practical matter, this means that DOE cannot reclassify the HLW that currently rests in the tanks at the Hanford site in Washington and West Valley site in New York.

As NRDC has repeatedly noted, this does not mean that DOE cannot remove waste from the tanks, treat it such that it no longer has fission products in sufficient concentration, and dispose of that waste in a manner other than in a geologic repository. What DOE cannot do in Washington or New York is declare the HLW in the tanks, in Area C or anywhere else at Hanford, as “waste incidental to reprocessing” and abandon it under a layer of grout.⁹⁹

5. The Draft WIR Determination Would Allow DOE To Arbitrarily Reclassify HLW So That The Agency May Avoid Compliance With The NWPA

The Draft WIR Determination flies in the face of this plainly stated Congressional language. According to the Draft WIR Determination, the Area C tanks, filled for decades with HLW produced directly from the reprocessing of spent nuclear fuel, are being redefined as low-level radioactive waste if:

In accordance with DOE O 435.1 and DOE M 435.1-1, DOE may determine (in a WIR Determination) that certain waste is incidental to the reprocessing of SNF, is not HLW, and may be managed as LLW if an evaluation shows that the criteria in DOE M 435.1-1 are met. The criteria in DOE M 435.1-1, Section II.B.(2)(a), are that the wastes:

⁹⁷ Section 3116(d)(1)(2).

⁹⁸ 71 Fed. Reg. 3,838 (Jan. 24, 2006).

⁹⁹ See 271 F.Supp.2d at 1265.

(1) Have been processed, or will be processed, to remove key radionuclides to the maximum extent that is technically and economically practical; and (2) Will be managed to meet safety requirements comparable to the performance objectives set out in 10 CFR Part 61, Subpart C, Performance Objectives; and (3) Are to be managed, pursuant to DOE's authority under the Atomic Energy Act of 11 1954, as amended, and in accordance with the provisions of Chapter IV of this Manual, provided the waste will be incorporated in a solid physical form at a concentration that (1) it is treated to reduce its level of radioactivity to the extent technically and economically practicable; (2) it is disposed in conformance with the safety requirements for low-level waste, 10 C.F.R. Part 61, Subpart C; and (3) it is solidified and does not exceed the radioactivity levels for the most radioactive category of low-level waste, referred to as the "Class C standard," set out in 10 C.F.R. § 61.55, or meets alternative requirements DOE may set. does not exceed the applicable concentration limits for Class C low-level waste as set out 1 in 10 CFR 61.55, Waste Classification[.]¹⁰⁰

This proposed action runs flat into the brick wall of the definition of HLW and the clear explication of its terms by the Federal District Court in Idaho, a substantive decision that was far from explicitly reversed by the 9th Circuit Court's ripeness decision. It is worth reminding DOE of that decision at length. First, the Court noted the clear purpose of the WIR process. The Court wrote that "[t]he DOE issued Order 435.1 to govern reclassification of that waste. That Order, according to DOE, sets forth three criteria, "each of which must be met," to reclassify HLW as low-level waste." The same situation is at issue in today's subject, the Area C Draft WIR Determination.

The Court then went to explain one of the deep legal infirmities in DOE's actions precisely relevant to the Area C Draft WIR Determination. The Court held,

This rigorous process, DOE implies, will protect against arbitrary action. However, one of those "three criteria" is not a benchmark that could be "met." It requires that HLW reclassified as low-level waste must meet "safety requirements comparable to the performance objectives set out in 10 C.P.R. 61, Subpart C" In other words, DOE will treat waste that it deems to be low-level waste as low-level waste. This is not a "third criteria" that must be "met" but is simply a statement of intent or fact.¹⁰¹

The same situation is presented today with the Area C WIR Determination. DOE will treat waste that it deems to be low-level waste as low-level waste. And while DOE tries to defensively gird the process with an inadequate Performance Assessment, the weaknesses of which are identified at length in the State of Washington Comments, and in our own technical evaluation (Kaltoven Decl., *passim*) there is no hiding the fact that there is no meaningful criteria in play here. Rather,

¹⁰⁰ Draft WIR Determination at 1-3, 1-4 (citations omitted).

¹⁰¹ 271 F.Supp.2d at 1265.

DOE has simply made a statement of intent that it will treat HLW as LLW and dispose of it in a way that is plainly contrary to law.

More than a decade ago the Idaho Federal District Court left no room for DOE to wiggle out from under the clear directions of Congress, and its same cautions are precisely relevant to the Area C Draft WIR Determination. The Court continued explaining Order 435.1, piece by piece, and further held:

There are really only two criteria that must be met. The first is that key radionuclides are removed to the extent technically and economically practical. This means that if DOE determines that it is too expensive or too difficult to treat HLW, DOE is free to reclassify it as incidental waste. The second is that HLW incorporated into a solid form must either meet the concentration levels for Class C low-level waste or meet such alternative requirements for waste classification and characterization as DOE may authorize. These “alternative requirements, are not defined, and thus are subject to the whim of DOE. While DOE has the authority to “fill any gap left ... by Congress,” *Chevron*, 467 U.S. at 843, it does not have the authority “to adopt a policy that directly conflicts with its governing statute.” *Maislin Indus., Inc. v. Primary Steel, Inc.*, 497 U.S. 116, 134-35 (1990).¹⁰²

Thus, the Court found that “DOE's Order 435.1 directly conflicts with NWPA's definition of HLW. NWPA's definition pays no heed to technical or economic constraints in waste treatment. Moreover, NWPA does not delegate to DOE the authority to establish alternative requirements” for solid waste. Because Congress has spoken clearly on that subject, “that is the end of the matter,” *Chevron*, 467 U.S. at 842, leaving no room for “alternative requirements.” Thus, DOE's Order 435.1 must be declared invalid under *Chevron*.¹⁰³ The Draft WIR Determination, just as the District Court found with the original Order 435.1, runs directly counter to Congress's clear directions that HLW be disposed of in a repository. Moreover, the ripeness concerns that drove the 9th Circuit's procedural reversal are clearly done away with by the explicit terms of the Draft WIR Determination.

6. The Solids and Sludges Abandoned In The Area C Tanks Are HLW And, In Any Event, Contain Fission Materials In Sufficient Concentration

Assuming *arguendo* that the language of the NWPA is unclear—which it is not—the second illustrative clause in the definition of HLW (“any solid material derived from such liquid waste that contains fission products in sufficient concentrations” provides no justification for the incidental waste exemption. An implication of this clause—that there is solid material derived from liquid reprocessing waste that does not contain fission products in sufficient concentrations

¹⁰² *Id.* at 1265, 1266; DOE attempt to blunt some of the force of this disapproving judicial opinion by suggesting that “[t]his provision in DOE M 435.1 also includes the following language: “or will meet alternative requirements for waste classification and characterization as DOE may authorize.” DOE is not using or relying upon this language in this Draft WIR Evaluation to any degree whatsoever.” Draft WIR Determination at 1-4, n.7. As the entirety of the Idaho decision makes clear, such lack of reliance on the “alternative requirements” clause is unavailing.

¹⁰³ 271 F.Supp.2d at 1266.

to be HLW—has no application to the waste DOEs plan to abandon at the bottom of the HLW tanks.

Any attempt to reclassify the HLW sediments and solids to be abandoned in the tanks as being “derived from” liquid reprocessing waste rather than “the highly radioactive material resulting from the reprocessing of spent nuclear fuel” would be incorrect. At Hanford, for example, DOE’s acknowledged the range of HLW—and that range includes solids as well as liquids (and slurry and sludge).¹⁰⁴ In this context, “derived from” necessarily entails additional treatment of the reprocessing waste to reduce its volume or radioactivity or to convert it into a solid form.¹⁰⁵

And even if the waste was derived solid material—which it is not—it contains fission products in sufficient concentration. The HLW abandoned in the tanks is at least as radioactive (and perhaps more so) than the HLW removed from the tanks for disposal in a geologic repository.¹⁰⁶ Nor can DOE assume that there was up to 100-fold “dilution” of the waste by the added grout for the purposes of regulatory compliance.¹⁰⁷ Thus, DOE’s interpretation of the NWPA is entitled to no deference since the incidental waste exemption is neither reasonable nor consistent with the statutory purpose of isolating HLW.¹⁰⁸

DOE is, once again, via the Draft WIR Determination, ignoring the definition of HLW of the NWPA to serve their purposes. First and most important, the incidental waste exemption runs directly counter to clear Congressional direction that HLW be disposed of in a deep, geologic repository. The intent of Congress is clear and that should be the end of the matter. Second, assuming *arguendo*, even if Congress was silent or ambiguous on the subject of HLW disposal, DOE’s action here today runs afoul of the NWPA by ignoring the basic inconsistency of treating as low-level waste the reprocessing waste that is at least as radioactive as waste removed for geologic disposal.

Such actions cannot stand. Exemptions from “. . . humanitarian and remedial legislation [must] . . . be narrowly construed, giving due regard to the plain meaning of statutory language and the intent of Congress. To extend an exemption to other than those *plainly and unmistakably* within its terms and spirit is to abuse the interpretative process.”¹⁰⁹ The NWPA’s authority over the requirements for environmentally sound and publicly acceptable disposal of radioactive waste

¹⁰⁴ See Tank Waste Remediation System, Hanford Site, Final Environmental Impact Statement, Volume Two, Appendix A, at A-12. (August 1996).

¹⁰⁵ See *e.g.*, 52 Fed. Reg. 5993-5998.

¹⁰⁶ See Complaint, Attachment E, at 8 (NRC Review of SRS HLW Tank Closure Methodology, June 30, 2000), where the NRC states that key radionuclides cannot be removed preferentially from the bottom of the tanks.

¹⁰⁷ See Cochran Decl. at 9. Even when assuming a 100-fold dilution or averaging of the radioactivity of the abandoned waste with the near zero radioactivity of the grout at the SRS tanks, 37 of the 51 tanks would still be more radioactive than the low-level waste standards of 10 C.F.R. § 61.55. It should also be noted that this mathematical averaging takes place even if there is no significant physical mixing of the grout and HLW (note that if DOEs could mix the solids and grout, they could readily remove the HLW). See Complaint Att. 19, Defense Nuclear Facilities Safety Board (“DNFSB”), SRS Report for Week Ending March 14, 1997 (1997) where the DNFSB expressed doubt about the effective mixing of the residual HLW sludge with the grout.

¹⁰⁸ *Reilly*, 976 F.2d at 40.

¹⁰⁹ *A.H. Phillips, Inc. v. Walling*, 324 U.S. 490, 493 (1945)) (emphasis added).

make it just such a “humanitarian and remedial” statute; thus, exemptions to it must be “narrowly construed.”¹¹⁰

This Area C Draft WIR Determination at Hanford, certainly the first of many, creates a broad, ill-defined loophole under the NWPA that fatally undermines the purpose and intent of Congress to ensure that the highly radioactive material resulting from the reprocessing of spent nuclear fuel is disposed of in a manner protective of the environment and public health.

7. The Incidental Waste Exemption of Order 435.1 Violates the APA

Also relevant and fully explained before we close, this Draft WIR Determination fails under the APA as well. Under the APA, a regulation must be struck down if it is “arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law.”¹¹¹ First, courts must “. . . reject constructions of a statute that are inconsistent with the statutes or that frustrate the policy Congress sought to implement.”¹¹² As discussed above, the incidental waste exemption is clearly inconsistent with the NWPA and would frustrate the intent of Congress. Second, it is well-settled that an agency’s decision must be supported by the administrative record, and Order 435.1’s administrative record is devoid of support for the incidental waste exemption.¹¹³ And finally, an agency may not shift its position without supplying a reasoned explanation for doing so.¹¹⁴ For decades, DOE has managed the reprocessing waste in the tanks at Hanford as HLW, and now grant themselves the authority to frustrate the intent of Congress without support from the administrative record and a rational explanation. For these reasons, Order 435.1’s incidental waste exemption is in violation of the APA.

To the extent that DOE has attempted to remedy its administrative record in contrast to its attempt to reclassify HLW in 2003 and 2004, it has failed. While this time it has put forward some minimal waste tank radiological and chemical inventory analyses following bulk waste removal; and modeling ground water transport of abandoned waste that is fraught with holes and weak assumptions,¹¹⁵ and this time has at least suggested LLW performance objectives for the post-closure tanks; it still provides no technical explanation of how the waste to be abandoned in the tank is no longer HLW. The studies it puts forward of abandoning the equivalent of several tons of spent reactor fuel buried on the banks of the Columbia River are unavailing and the administrative record provides no foundation for a decision that will last for a nearly endless expanse of time. The Draft WIR Determination is not supported by law or fact in the administrative record and is, therefore, arbitrary and capricious and in violation of the APA.¹¹⁶

¹¹⁰ *Id.*

¹¹¹ 5 U.S.C. § 706(2)(A). The Draft WIR Determination is also impermissible and contrary to the APA for these reasons.

¹¹² *Bonneville Power Admin.*, 909 F.2d at 1306.

¹¹³ *Sierra Club v. Dombeck*, 161 F.Supp.2d 1052, 1070 (D.Ariz. 2001), *citing Motor Vehicle Mfgs. Ass’n. v. State Farm*, 463 U.S. 29, 43 (*State Farm*).

¹¹⁴ *National Coalition Against the Misuse of Pesticides v. Thomas*, 809 F.2d 875, 883 (D.C. Cir. 1987); see also *State Farm*, 463 U.S. at 57.

¹¹⁵ See Kaltofen Decl., *passim*.

¹¹⁶ *State Farm*, 463 U.S. at 43.

8. The Draft WIR Determination Reverses Nearly A Half Century Of Waste Designation at Hanford

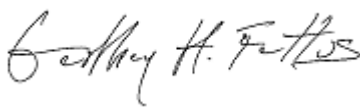

It is a well-settled principle that an agency may not shift its position without supplying a reasoned explanation for doing so.¹¹⁷ Since just after the Manhattan Project, the reprocessing waste disposed of in the tanks in Washington has been understood to be HLW. Indeed, DOE have spent decades analyzing and managing the HLW in the tanks, as evidenced by publications such as the *SRS High-Level Waste Tank Closure Draft Environmental Impact Statement* (November 2000).¹¹⁸ And in the early 2000s, when the first iteration of this contentious dispute was fought, Congress explicitly passed on giving to DOE the power of reclassification of Hanford's HLW.

Literally thousands of documents have been developed and perhaps millions of pages have been written about how to manage and dispose of Hanford HLW tanks. Now, for the sake of expediency and without technical or legal support, DOE has issued this Draft WIR Determination in hopes of defining away their most difficult cleanup problem. No bright line standards, no intelligible criteria whatsoever limit DOE's discretion to reclassify what has been, until now, universally accepted as HLW destined for a geologic repository. The failure to provide any legally adequate explanation for this reversal of position is arbitrary and capricious and in violation of the law.¹¹⁹

VI. Conclusion: The Draft WIR Determination should be Withdrawn

For the reasons articulated above, DOE should withdraw the Draft Determination and commence working with the immediately affected States of Washington and Oregon, the Confederated Yakama Tribes, and interested members of the public on a cleanup trajectory for the high-level radioactive wastes (HLW) in the more than 177 tanks at the Hanford Nuclear Reservation that is both scientifically defensible and publicly accepted.


Sincerely,

	
<hr/> <p>Geoffrey H. Fettus Senior Attorney Natural Resources Defense Council</p>	<hr/> <p>Tom Carpenter Executive Director Hanford Challenge</p>

¹¹⁷ *National Coalition Against the Misuse of Pesticides v. Thomas*, 809 F.2d 875, 883 (D.C. Cir. 1987); *see also State Farm*, 463 U.S. at 57.

¹¹⁸ *See Tank Waste Remediation System, Hanford Site, Final Environmental Impact Statement* (August 1996).

¹¹⁹ *State Farm*, 463 U.S. at 57.

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Comments on Draft Waste Incidental to Reprocessing Evaluation for Closure of Waste Management Area C at the Hanford Site

This response is produced on behalf of Hanford Challenge and the Natural Resources Defense Council (NRDC) to provide a technical analysis of the Department of Energy's plans to reclassify certain amounts of high-level radioactive waste (HLW) in steel tanks under a layer of grout, adjacent to the Columbia River in the State of Washington. The author's time is being compensated at a public interest rate. This response closes with the author's credentials.

Part 1. Introduction

The U.S. Department of Energy (DOE) has issued a proposal to reclassify High-Level Nuclear Waste (HLW) remaining in the bottom of Hanford's Waste Management Area C Farm tanks (WMA C) to be considered "low-level" waste. This report is a response to the DOE's proposal as described and reviewed in:

US DOE, "Draft Waste Incidental to Reprocessing Evaluation for Closure of Waste Management Area C at the Hanford Site" and "Performance Assessment of Waste Management Area C, Hanford Site, Washington RPP-ENV-58782"

WA Ecology (2017) State of Washington Department of Ecology Review and Comments of Appendix 1 Performance Assessment for Waste Management Area C (WMA C) Documents

OR DOE, Oct. 4, 2018 Comments to US DOE Office of River Protection

Yakama Nation Environmental Restoration And Waste Management Program Fact Sheet Draft Waste Incidental To Reprocessing Evaluation

This introduction addresses the regulatory question, "Yes or no, is residual nuclear waste left in Hanford tanks still High-Level Waste?" There is also an engineering question, "Must High-Level Waste be abandoned in shallow burial?" A third question, "Is this a good idea?" is based on the science of nuclear waste disposal and is addressed in Part 2.

This response is not written as a lawyer's critique of the legality of DOE's proposal. The law precludes DOE from reclassifying Waste Incidental to Reprocessing (WIR) as

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anything other than HLW. This response is written entirely from an engineer's perspective. This report explains the science behind why HLW is so uniquely dangerous, and why generations of physicists, engineers and administrators have regulated it in the manner they have.

HLW is a dangerous mix of radioisotopes and chemicals left over from Cold War-era atomic bomb construction. At Hanford 525 million gallons of high-level nuclear waste was created between 1943 and 1989. The waste includes at least 56 million gallons of highly-radioactive waste from the processing of spent nuclear reactor core materials currently stored in aging underground steel tanks. In contrast, Low-level waste contains materials such as contaminants removed from laundered work uniforms or disposable protective items like gloves and booties. DOE proposes to reclassify HLW as WIR, in effect, treat HLW as if it were LLW.

It is a universal, long-held scientific judgment that HLW must be disposed of in a deep geologic repository to protect human health and the environment. HLW is produced in the reprocessing of spent nuclear fuel (defined as unprocessed material withdrawn from a nuclear reactor after irradiation). Historically reprocessing activities have occurred in the United States in a number of locations largely for the purposes of nuclear weapons production and reactor fuel management.

The specific radiological characteristics of HLW produce hazards associated with both acute and chronic exposure to ionizing radiation. Currently, large volumes of HLW are found in interim storage at the Department of Energy's ("DOE's") Hanford Reservation, Savannah River Site ("SRS") and the Idaho National Engineering and Environmental Laboratory ("INEEL"), awaiting ultimate geologic disposal at a site that has not been determined. At issue in this DOE proposal is the fraction of HLW currently in interim storage in certain Hanford tanks that the DOE will seek to (contrary to the 1982 Nuclear Waste Policy Act) dispose of outside of a deep geologic repository.

An unstated issue that has even greater implications is how much HLW DOE will eventually propose to reclassify and leave at the Hanford site, whether left over in tanks or residing in soils and groundwater resources from leaks and deliberate dumping of HLW to the soils.

In a 1957 report prepared at the request of the U.S. Atomic Energy Commission, the National Research Council of the U.S. National Academies "endorsed the concept of geological disposal—placing high-level waste (HLW) in a carefully selected deep underground formation, where it would remain isolated from human beings and the

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environment long enough for the radioactivity to decay to near natural background levels” (Nat. Res. Coun. 2001).

In 1990 the National Research Council reaffirmed this position when it stated, “There is strong worldwide consensus that the best, safest long-term option for dealing with HLW is geological isolation” (Nat. Res. Coun. 1990). This position was also adopted by the U.S. Congress and embodied in the Nuclear Waste Policy Act of 1982.

In 1995, the Oak Ridge National Laboratory for DOE compiled estimates of radioactivity of the high-level wastes in storage at Hanford. The estimates are in units of MCi (Millions of Curies, a.k.a. equivalent to millions of grams of radium-226). These amounts have been reduced, in some cases by 15 to 20 percent due to radioactive decay, and by removals since 1995.

<i>Tank Wastes</i>		<i>Capsule Wastes</i>	
<u>Liquid</u>	<u>Solid</u>	<u>Strontium</u>	<u>Cesium</u>
68.5	123.3	44.9	101.2

[DOE, *Integrated Data Base Report-1995: U.S. Spent Nuclear Fuel and Radioactive Waste Inventories, Projections, and Characteristics*, DOE/RW-0006, Rev. 12, December 1996, p. 52.]

By comparison the annual limits on intake by ingestion for a radiation worker to ensure the workers dose does not exceed 5 rems per year is 0.0004 Ci of strontium-90 or 0.0001 curies (“Ci”) of cesium-137. [EPA, *Limiting Values of Radionuclides Intake and Air Concentration and Dose Conversion Factors For Inhalation, Submersion, And Ingestion*, EPA-520/1-88-020, September 1988, pp. 49 and 71] Thus, the wastes at Hanford contain millions of “annual limits on intake” for nuclear workers. In its concentrated form the HLW in the tanks is chemically toxic in addition to being intensely radiotoxic. This is why Congress has required that all high-level radioactive waste be isolated in one or more deep geological repositories.

The HLW sits underground in decaying steel tanks, still physically and radioactively hot. Hanford's high-level radioactive waste is contained in 177 underground waste tanks. More than a third have leaked, and nearly all are beyond their design-lives. 28 of the tanks are double-shell tanks and 149 are single-shell tanks. These tanks are grouped in “farms” scattered around the Hanford Nuclear Reservation in eastern Washington.

The tanks hold waste created during the process of extracting plutonium from spent fuel, and contain both radioactive and chemical waste. It has also separated out into sludge, liquid, solids, and vapors. Its complexity, along with the fact that it is highly radioactive,

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caustic, and toxic, makes it particularly difficult and dangerous to treat. The only plan for dealing with Hanford's tank waste is to immobilize the waste in glass through a process called vitrification. The Waste Treatment Plant (WTP) is being built for that purpose.

At least sixty-nine tanks have been known to leak in the past, one (recently emptied) double-shell tank had failed and was leaking waste into the space between the two shells of the tank. The leaked waste is a huge cleanup challenge. The tanks are able to accommodate between 55,000 to 1,200,000 gallons of waste and are buried about 7-8ft. under the soil. The majority of the leaked waste is under the tanks in the vadose zone, the area between the surface of the soil and the groundwater, and some of the waste has reached the groundwater. In addition to the waste *inside* the tanks, waste was also deliberately discharged to the soil. An estimated 120 million gallons of waste from the Hanford tanks were directly ejected into the soil in this manner.

Some of the HLW has already escaped from the tanks, and is in the soil underneath the tanks but above the buried groundwater table (the vadose zone). About 1 to 1.5 million gallons of HLW have leaked into soil or groundwater. Most of Hanford's contaminated groundwater ultimately will empty into the Columbia River. The radioactive contamination in groundwater headed towards the river was first detected in 1993. This contamination includes fast-moving technetium-99, an isotope with a half-life of about 211,000 years. High-level nuclear waste was predicted to first reach the Columbia River by 2017 (reference: Science News, Vol. 152, No. 25/26, Dec. 20-27, 1997, p. 410).

If nothing is done about it, these tanks will eventually all leak, resulting in potentially catastrophic releases of radioisotopes into the environment. Sixty-nine tanks have already leaked. To prevent further releases, the HLW must be removed, stabilized by making it into a glass-like material, and then stored in an inaccessible underground geologic repository. Once in the repository, the HLW will have the best chance to be isolated from human activities for hundreds of thousands of years.

The Draft WIR Determination for Area C Tanks

The proposal by the DOE suggests leaving some of the HLW right where it is, at the bottom of the decaying tanks at Hanford. The proposal is called, "Draft Waste Incidental to Reprocessing Evaluation for Closure of Waste Management Area C at the Hanford Site" (also called the draft WIR, see DOE Order 435.1). In the WIR proposal the DOE states, "Following removal of the waste, the tanks, a relatively small amount of remaining waste (residual waste or residuals), and certain ancillary structures (a catch tank, a process vault with smaller tanks, and diversion boxes) will be filled with grout to stabilize them and immobilize the waste. Thereafter, the WMA C tanks, residual waste, and ancillary structures (including integral equipment and buried pipelines)

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will be covered with an engineered surface barrier and closed in place” (US DOE 2018, p. 1-1).

This Draft WIR Evaluation represents DOE’s first step toward a USDOE proposal to permanently leave the estimated 4% (by volume) of waste remaining overall in the 16 single-shell tanks in Hanford’s C Tank Farm, with a cement grout added to the tanks.

DOE proposes leaving 62,900 gallons (about 500,000 Curies) of High-level radioactive waste in the sixteen C-Farm tanks at Hanford. C-Farm is one of eighteen such waste tank farms on the Hanford site. WMA-C received wastes created by the reprocessing of spent nuclear fuels, including Plutonium-Uranium Extraction Plant reactor fuel wastes and spent nuclear fuel fission wastes including strontium and cesium burned-fuel fission products (DOE 2018 p. 48 to 51). According to the US Nuclear Regulatory Commission (NRC, references: <https://www.nrc.gov/waste/low-level-waste.html> and <https://www.nrc.gov/waste/high-level-waste.html>),

“High-level radioactive wastes are the highly radioactive materials produced as a byproduct of the reactions that occur inside nuclear reactors. High-level wastes take one of two forms:

- Spent (*used*) reactor fuel when it is accepted for disposal
- Waste materials remaining after spent fuel is reprocessed”

“Low-level waste includes items that have become contaminated with radioactive material or have become radioactive through exposure to neutron radiation. This waste typically consists of contaminated protective shoe covers and clothing, wiping rags, mops, filters, reactor water treatment residues, equipments and tools, luminous dials, medical tubes, swabs, injection needles, syringes, and laboratory animal carcasses and tissues.”

“Because of their highly radioactive fission products, high-level waste and spent fuel must be handled and stored with care. Since the only way radioactive waste finally becomes harmless is through decay, which for high-level wastes can take hundreds of thousands of years, the wastes must be stored and finally disposed of in a way that provides adequate protection of the public for a very long time.”

Under federal law (the 1982 Nuclear Waste Policy Act), High-Level Nuclear Waste shall be retrieved and permanently disposed in a deep geologic repository, which does not yet

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exist. Low-Level Waste or monitored-retrievable waste, on the other hand, may be disposed (or respectively, stored for 50 – 100 years) near the surface. Notably WIR fails to meet either definition, being neither low-level, nor retrievable (or monitorable) after grouting.

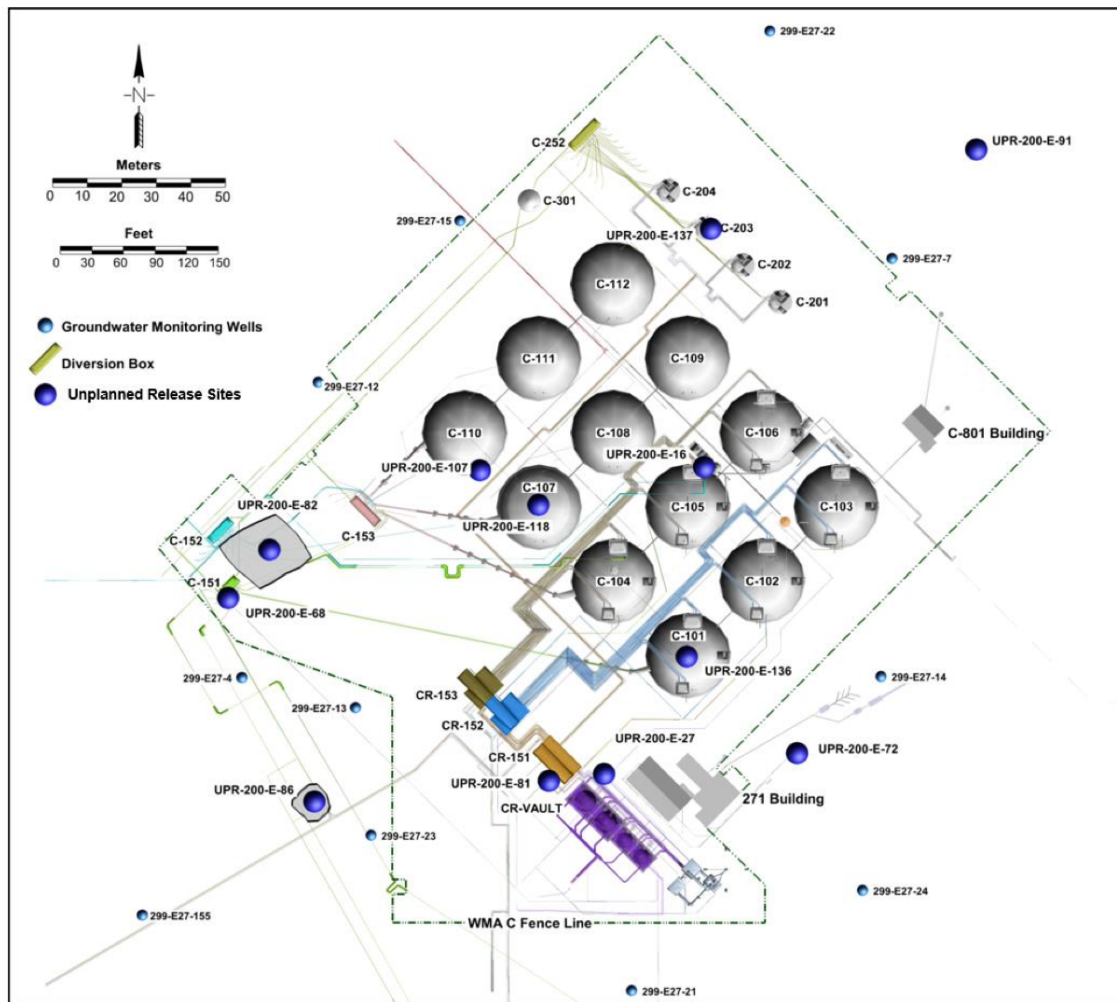


Figure 1: (above) Waste Management Area C, constructed at Hanford from 1943 to 1952 and location of the proposed abandoned high-level waste area.

Abandoned HLW residuals (the product of nuclear processes in reactors and/or nuclear fuel reprocessing waste) in WMA C tanks are of course, not low-level or monitored-retrievable wastes as defined by the US NRC or the 1982 Nuclear Waste Policy Act. In fact the act of grouting-in-place along with tank structures and equipment, actually prevents the future retrieval of abandoned HLW.

Comments by nonfederal stakeholders

The State of Oregon and the State of Washington have produced official statements regarding the acceptance of abandoning residual HLW. These important stakeholders have supported minimum 99 percent tank waste removal, off site storage of HLW in a deep geological repository, pretreatment of tank or low activity wastes, and avoidance of "supplemental" treatment technologies.

Alternatives that include shallow surface burial of HLW in the tanks do not meet the requirements of the States of Washington and Oregon and the Tri Party Agreement (Reference: Public Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA, USDOE, 2009).

Other nongovernmental stakeholders such as Hanford Challenge, have commented to the US DOE that all HLW should be removed from the tanks, and adequate characterization be performed to determine whether tanks can be removed and leaked tank waste retrieved and treated from beneath the tanks. This is distinct from categorically treating all soil overburden as HLW. Overburden should be treated according to relevant and applicable environmental laws, legal agreements, and regulations (Reference: Letter from Hanford Challenge to US DOE dated January 5, 2010). The Affiliated Tribes of Northwest Indians Resolution 10-02 on this subject commented that 99.9% removal of single-shell tank wastes was appropriate and required under existing regulations.

In the past DOE was also a proponent of minimum 99% residual waste removal from tanks. The US DOE responses to public comments in the 2012 Tank Closure and Waste Management Environmental Impact Statement (TC & WM EIS) notes that:

“DOE’s preferred retrieval option (i.e., to retrieve at least 99 percent of the tank waste) is consistent with the TPA goal of residual waste not exceeding 10.2 cubic meters (360 cubic feet) for 100-series tanks or 0.85 cubic meters (30 cubic feet) for the smaller 200-series tanks, corresponding to 99 percent retrieval. Decisions made by DOE on the proposed actions will be based on a number of factors, including health and safety, environmental, economic, and technical considerations; agency statutory missions; and national policy considerations.”

This language mimics the original Tri-Party Agreement between the US DOE, US EPA and the Washington Dept. of Ecology. The Washington Dept. of Ecology states that,

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“Milestone M-45-00 of the Tri-Party Agreement (TPA) calls for retrieving as much tank waste as is possible. Tank waste residues shall not exceed 360 cubic feet in each of the large tanks, 30 cubic feet in each of the smaller tanks, or the limit of waste retrieval technology capability, whichever is less. The US Department of Energy (USDOE) is expected to reach the “limits of technology” before completing retrieval. If USDOE cannot meet the 360- or 30-cubic-foot goal, then they must use another technology or request a waiver as described in Appendix H of the TPA. As part of the Proposed Consent Decree, if USDOE cannot meet the 360- or 30-cubic-foot goal, they will be required to use two or more technologies for retrieving tank waste, and each must reach their limits of technology.” (Reference: Appendix D of the Tri-Party Agreement (1989), Hanford Federal Facility Agreement and the 2009 Proposed Consent Decree No. 08-5085-FV and Tri-Party Agreement Modifications for Hanford Tank Waste Treatment.)

According to the State of Washington’s official statements on the use of dual technologies for closure, the use of any given closure technology must allow Hanford to prepare for completing retrievals and tank closure, with a smooth transition to the second or any following technology. The presence of cementitious grout prior to complete tank closure affects future remediation of residual wastes. The grout monolith filling the partially closed tank prevents effective removal of radioactive wastes that have leaked from existing tanks into the soil column beneath the tanks, and adds to the disposal burden of the tank residuals simply by adding the mass of the grout. This added grout must also be handled as HLW (40 CFR 261, 10 CFR 60).

Improper assumptions and assertions by DOE

The US DOE proposes changing the status of residual HLW in WMA C tanks to speed up the closure process. To justify leaving HLW in the tanks, the DOE has made a series of engineering errors.

(1) DOE rejects available (or foreseeable) technologies to remove the residual HLW from the tanks. The data do not even show that the limited tank-washing efforts have exhausted their utility; no further technologies have been explored.

(2) Without providing comparative alternatives risk data, DOE believes that abandoning wastes in the shallow subsurface creates less

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risk than removal, treatment, and use of a geological repository. The clear and documented uncertainties in DOE's analysis of the magnitude and timing of leaks from the residual abandoned HLW make it impossible to quantify the risk relative to removal of HLW from shallow burial.

(3) The consequences of abandoning waste to both public and environmental health and safety are ignored or minimized (see details in Part II). Comments by WA Ecology and data from US DOE's own analyses show that the residual HLW will exceed applicable legal standards before the expiration of the modeled 10,000 year period, and in fact, exceeds these legally-required quantitative levels already.

(4) Installing grout above the HLW will not isolate the waste for 10,000 years, but will guarantee that HLW eventually reaches the Columbia River. Migration from WMA C to the Columbia River could take as little as 10 years, even assuming that no accidental criticality is ever initiated.

(5) Abandonment and grouting will delay the achievement of legally-required cleanup milestones, rather than cause them to be met in a more timely fashion. It would be much more correct to say that the milestones had been moved rather than "reached".

The DOE has not proven the correctness of these assumptions in its WIR proposal and accompanying PA. No data at all are provided for assumption 2, that treating HLW as HLW would cause greater exposures. The needed analysis of quantified risks from the proposed and existing alternatives are not provided; only a statement that the PA shows "minimal" risks for the abandonment alternative is given. Normally a focused feasibility study would be done to detail the actual risks of complete removal. Assumption 5, abandonment is more timely, ignores the increased difficulty in removing the HLW already in the vadose zone beneath the tanks. Grouting permanently forecloses this required milestone. Detailed discussions of why assumptions 2, 3 and 4 are provably incorrect are in Part 2 of this document.

The Washington Department of Ecology has made its own comments on the DOE Performance Assessment for WMA C. Many of these comments address inadequacies in the justification for reclassifying HLW to LLW in preparation for abandoning HLW in the C-Farm tanks. Based on the WA Ecology review of the US DOE's Performance assessment (US DOE 2018b), these assumptions are not correct. (Technical aspects of the WA Ecology comments are discussed in Part 2 – technical considerations).

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From the 2017 Status Report p. 1-16 (US DOE 2018b) which addresses the onsite disposal of low level waste (LLW), “Some residual activity will remain in the waste sites after remediation has been finalized, but it is not expected to contribute significantly at that location in the composite analysis, given that cleanup has been based on numerical modeling calculations and meets Washington State regulations”. The statement recognizes that adherence to Washington State regulations are a basis for acceptable LLW disposal at Hanford, but the process of attempting to reclassify HLW as LLW is not lawful under State of Washington regulations.

One important uncertainty is that the grout treatment approach departs from the widely assumed use of vitrification as a waste form. The State of Washington does not accept deviation from what it believes is an agreement to use vitrification for waste, unless the alternative is “as good as glass.” This difference introduces uncertainty into the acceptability and potential timelines for alternatives to HLW removal and vitrification technologies. Although the magnitude of delays due to lack of acceptance are not readily quantifiable, the consequences (delays, waste disposition elsewhere, etc.) of rejection of an alternative to HLW-removal and vitrification technologies are potentially significant.

Departure from the agreed-upon removal, vitrification and/or “good as glass” treatment option entails a significant risk of delays due to litigation between stakeholders. Certainly this type of delay has occurred in the past at Hanford. Stakeholders may look to prior experiences at Hanford to inform their decisions about acceptance of tank waste abandonment and grouting, and other nonvitrification treatment or geologic repository options. These delays are above and beyond the delays involved in petitioning federal bodies (NRC, Congress, EPA) for regulatory waivers. DOE’s decision process flowchart notes that a search for new applicable technologies that could assist in meet the original milestones for tank waste removal *will not even begin*, until the regulatory waiver process is exhausted.

Another area of uncertainty is that there is no “limit of technology” definition for removal of the remaining HLW in the WMA C tanks (US DOE 2018 p. 4-15). For example, retrieval of HLW from tank C-101 began on 12/12/2012. The WIR opines that DOE had reached the limit of high pressure water removal operations in tank C-101, and concludes that, “little or no additional waste could be retrieved by continued deployment, resulting in little or no additional reduction of risk.” The DOE fails to include the key fact that HLW that is insoluble to alkaline water alone may be soluble using a different chemistry. DOE also abandoned granular solids in Tack C-103 that failed to pass the inlet screen, but that could have been retrieved with minor process modifications (US DOE 2018 p. 4-24).

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The failure to properly define the limits to technology means that HLW would be abandoned in place without employing additional technologies that could retrieve refractory solids in the WMA C tanks. Failure to remove the remaining HLW in the tanks makes it far more difficult to remove the tanks themselves. Tank recovery and removal is likely to be a key initial step to removing leaked HLW in the vadose zone below the tanks. Adding grout of course, only increases the difficulty of retrieval, potentially making HLW remediation from the vadose zone impossible.

During the two year campaign to remove HLW from tank C-101 the solids removal rate twice rose from less than 0.1 % solids removed in slurry to 0.5 % removed or greater. (Higher solids percentages mean that HLW is still being retrieved at a significant pace.) This is significant because, had DOE ended the retrieval after the first drop to 0.1% solids removal, then all of the remaining material removed after that point would have been abandoned instead of retrieved. When the solids removal rate dropped below 0.1% for a third time, DOE simply ended the procedure and declared that the technology limit had been reached.

In experimental design, this behavior is called p-value hacking, meaning stopping data collection when one gets the result they were hoping for. (P-value hacking, when detected by reviewers, normally results in rejection of a scientific study.) DOE failed to collect data on whether this third “minimum” solids removal test was truly the rock bottom, or just another drop preceding a return to significant solids removal (a drop and rise that had already occurred twice for this tank).

It is reasonable and prudent to want to limit costs and risks in a clean up, but the risk of verbally converting High-Level nuclear waste into Low-Level nuclear wastes are grave. HLW will be vitrified and sent to a geologic repository. LLW will be covered with cement and left in the shallow subsurface, along with any vadose zone nuclear waste made inaccessible by grouting.

It is disingenuous to say that water spraying is the limit of America’s nuclear technology. Japan’s Atomic Energy Agency (JAEA) is developing an entirely new set of nuclear waste retrieval technologies at its Naraha Nuclear Disaster Response Center. At Naraha Japan has constructed full scale mock ups of nuclear facilities where HLW must be recovered and disposed of. Robotic, drone, virtual reality and other technologies expand the limits of what technology can safely accomplish to recover and properly inter HLW. (Photo: below, Naraha Nuclear Disaster Response Center, Japan; author photos 2017)



Grouting in place when limited data may (or may not) show the limits of water spray technology fails to prevent future radioactivity mobilization. Grouting also prevents future uses of advanced technology for waste retrieval. It creates a physical barrier above abandoned wastes that makes it difficult and likely impossible to use improved techniques for HLW recovery at WMA C.

Whatever Japan (or Los Alamos or Savannah River or WIPP) learn, the abandoned HLW will remain at the bottom of WMA C; waiting to leach and make its way to the Columbia River. Barring removal and treatment, the Columbia River will, with certainty, be the ultimate repository for abandoned High-Level waste.

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This proposed permanent unmonitored nonretrievable storage of HLW in shallow burial creates risks to the environment and risks to future site users. In addition, it would leave transuranic waste associated with nuclear weapons production far more vulnerable to intentional recovery by nonstate actors. This would create substantial national security risks should any part of this material be removed without authority. Directional drilling, meaning drilling that begins beyond any grouted area and then redirects horizontally to intrude into abandoned transuranic waste, is a simple, truck-mounted, and commonly-available technology. DOE proposes to install an anti-intrusion or “capping” grout above the abandoned wastes, but this cap is not meaningful when anyone can rent a truck-mounted directional drilling machine that requires only a single operator and a few uninterrupted hours of drilling.

Is abandoned HLW still HLW?

The answer to the opening question is yes; residual nuclear waste left in Hanford tanks is still High-Level Waste because this is the law of the United States and of the State of Washington. The DOE proposal and accompanying PA do not document that HLW could be controlled as if it were LLW even if the regulatory environment changed (even with some fraction of the key isotopes previously removed from the HLW).

The answer to the second question, “Must High-Level Waste be abandoned in shallow burial?” is no; the DOE has not proven that doing so is safer, faster, or technologically-necessary compared to the mandated full removal and treatment via vitrification. DOE has not proven that its proposed actions meet applicable standards for the 10,000-year compliance period required by NUREG-1854, nor even for the (unapproved) 1000-year period proposed by DOE in DOE M 435.1-1.

Specific technical failures of the proposal to grout HLW in place in shallow burial at WMA C are addressed in Part 2. This second section discusses details of how the proposed grout-in-place remedy fails to meet requirements for environmental and public health standards for nuclear waste in shallow burials. These failures include reliance on manifestly-incorrect or data-free assumptions; and poor analysis or documentation of grout performance, tank inventory, soil and waste chemistry, and groundwater flow conditions.

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Part 2. Technical limits to grouting and abandonment

HLW – what’s at stake
Grout monolith longevity
Tank Inventory
Accidental criticality
Shallow land burial of HLW and vadose zone chemistry
TRU, technicium-99, iodine-129 and neptunium

HLW - what is at stake: WMA C consists of sixteen single shell tanks, and is one of eighteen tank farms at the Hanford site. Most of the HLW in these tanks has been removed, but four percent (about 66,000 gallons) of the original HLW remains in these older tanks. The removed portion was transferred to the AN-Tank Farm, which has double shell tanks. Were DOE to actually reclassify HLW to LLW at the C-Farm, this would set a precedent to do the same at the remaining seventeen tank farms, involving millions of gallons of HLW left in tank residuals and permanently stored at Hanford. With that in mind, this report examines the conclusions of the Draft WIR determination in chapter 5 (the waste will meet the safety requirements comparable to LLW disposal regulations) and the PA and finds them wanting.

Grout monolith longevity: Grout has never been tested under realistic conditions. DOE suggests that grout within the abandoned waste tanks is required to protect the environment from residual HLW for 1000 years (the “compliance period” vs. the sensitivity/uncertainty period of 10,000 years). The 1000-year time frame is of course, highly abbreviated compared to other analyses of waste migration performed at Hanford. DOE, in an act of self-regulation, created this specific time period in a DOE “order”. This shortened period of 1000 years does not meet the requirements of 40 CFR 191, which specifies a required period of 10,000 years (NRC 1995). The 2012 TC & WM EIS carries the grout leachate model past the year 4000 mark, when Columbia River activity levels for technetium-99 and iodine-129 would be reaching their equilibrium maxima. Current models developed from empirical laboratory grout simulations cannot provide this kind of assurance for either 1000 years or 10,000 years. A 1995 PNL grout test at Hanford noted that (PNL 1995),

“The semi-infinite solid diffusion model was selected as the most representative model for describing leaching of grouts. The use of this model with empirically derived leach constants yields conservative predictions of waste release rates, provided no significant changes occur in the grout leach processes over long time periods.”

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The use of this model demands that the grout not only last for 1000 years, but that its properties must not change significantly over that entire period to remain protective. Certainly such a requirement is completely untested. The 1995 Hanford grout leaching tests ran on grouts that had set for 46 days, or 0.013 % of the required 1000 year-life of grouted HLW in WMA C tanks (or less than 0.004 % of the 4000 year climb toward the Columbia River equilibrium concentration, or 0.0013 % of the 40 CFR 191-required 10,000 years).

These same 1995 grout test reports noted (page 2.2) that any fracturing in the grout monolith formed in the abandoned tanks would invalidate the presumed groundwater velocity in grout of 0.5 to 5 cm per year. Normally groundwater would be expected to slowly diffuse through the grout monolith through a series of interconnected pores. This is the basis of the expected groundwater velocity of 0.5 to 5 cm per year. For example, the rate of groundwater flow in unfractured volcanic (igneous) rock is on the order of 0.002 cm per day and less. For fractured volcanic rock, groundwater can flow at a rate of 250 cm per day (Duffield citing Domenico & Schwartz 1990). This is a difference of nearly five orders of magnitude.

In effect, fracturing in grout due to temperature change, loading stress, imperfections in grout chemistry, ground subsidence, mechanical strain, or grout composition boundary (where anti-intrusion grouts and mechanical loading grouts meet); can cause an immediate catastrophic failure of the grout monolith in a tank. It is certainly possible that such a fracture could form during the initial pour and set of a grout lift during tank abandonment. This means that the grout would not survive a millennium; rather it would not even survive its first day in place.

Notably, a 1000-year grout life is still double the expected life of the WMA C surface barrier, which is designed to have a functional life of only 500 years. In contrast, the peak dose rate for all isotopes occurs at 1,500 years, and the peak radon flux from WMA C occurs at 10,000 years. That's still better than the presumed life of institutional controls for Hanford, which is 100 years, or 10% of the expected grout life, or 1 % of the 10,000-year compliance period required by NUREG-1854.

Once grout fails in the tanks, any radioisotopes leached from the residual HLW left in tanks can move to the Columbia River in a relatively short time. The draft DOE WIR evaluation notes that, "Travel time of water through the unconfined aquifer from the 200 East Area to the Columbia River has been estimated to be in the range of 10 to 30 years" (US DOE 2018 sec. 2.1.5.3.3). Other estimates in the same reference suggest a maximum travel time of 33 years, based on reduced wastewater recharge in the 200 Areas. This is still only a small fraction of the already short design time of 1000 years before failure.

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Tank inventory: The total amounts of plutonium and other long-lived isotopes stored in Hanford's 177 waste tanks are large. Technetium-99 is one of the most problematic isotopes at Hanford, because it is one of the most mobile radioisotopes once it reached groundwater. Its complex chemical behavior makes it difficult to immobilize in solid forms. It has a half-life of 211,000 years. The total amount of technetium-99 in tanks is about 26,500 Curies (PNNL 2014). Of the total, 11,400 Curies was originally stored in the single shell tanks. Most of the double shell inventory is in the 200-E Area. If the waste tanks generally were allowed to become permanent repositories for the 4% abandoned HLW residual proposed by DOE for WMA-C, this would be 1,060 Curies of technetium-99 left in shallow burial at Hanford. This is in addition to the 652 Curies of technetium-99 already known to have reached Hanford sediments (Ibid).

With the exception of the complexed pertechnetate species of technetium, the actual form of the up to 25% fraction of soluble technetium compounds is not known. This means that the mobility in grout monoliths or groundwater of this soluble technetium fraction is also not known. If 25% of the technetium is in the tank supernatant, this implies that any residual abandoned in the tanks will be relatively enriched in technetium, compared to the supernatants that will be treated via vitrification.

Note that the actual amounts of long-lived waste isotopes were not originally inventoried or recorded at Hanford at the time of disposal. These amounts are inferred from the 98,892 metric tons of uranium and 629 metric tons of thorium oxide reprocessed in spent fuels at Hanford. From each ton of uranium-238, Hanford produced about a half pound of plutonium (93% of that was as plutonium-239, reference: PNNL 2015). The total estimated plutonium-239 inventory at Hanford is 23,000 kilograms. Plutonium in waste streams sent to the tanks ranged from 0.09 Curies per metric ton to 3.9 Curies per metric ton.

After grouting, plutonium in the waste tanks exists in both soluble (Pu^{5+} and Pu^{6+}) and less soluble (Pu^{3+} and Pu^{4+}) forms. The solubility and groundwater mobility will vary depending on what other nonradioactive chemicals (like iron) are present in the tanks. As with technetium, the final form and properties of plutonium in grout monoliths will be unknown, and likewise their groundwater transport properties would also be unknown (Ibid).

Radiochemical contamination in Hanford tanks dominates planning and modelling work, but the nonradioactive chemicals in tanks wastes are also important. The nonradioactive contaminants can negatively impact soil and HLW chemistry, alter neutron absorption behavior in HLW, and add to health or accidental detonation risks. Some of the chemical

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constituents discovered in tanks wastes are mercury, acetonitrile, benzene, cadmium, hydrazine, nickel, polychlorinated biphenyls (PCBs) and vinyl chloride (Hanford Waste Inventories for Cumulative Impact Analysis, Appendix S, 2012).

Hanford's radioisotope inventories have large uncertainties. The draft WIR evaluation notes that, "A previous assessment of limitations to the HDW model provided in HNF-3273, 'Hanford Defined Waste Model Limitations and Improvements,' showed that tank-specific HDW model estimates and tank sample results can vary by one to two orders of magnitude." These uncertainties apply to the materials discussed including TRU, technetium-99, iodine-129, zirconium-93, carbon-14, cesium-137, strontium-90; as well as isotopes not discussed specifically but present in the WMA C tanks such as isotopes of americium, neptunium, cobalt-60, europium, thorium, gadolinium, tritium, radium and others.

Uncertainty notwithstanding, there are more than 600 Curies of americium-241 and more than 17,000 Curies of cesium-137 estimated to be in WMA-C tanks according to the estimated inventories used in the PA (Some tanks have updated cesium-137 inventories due to retrieval operations. Post-retrieval samples showed that actual cesium-137 inventories were generally higher than the estimated inventories.) Included in these figures are 8.5 Curies of americium-241 and 187 Curies of cesium-137 in WMA C pipelines (2014 PA estimate). Given, however, that the actual supernatant to solids activity ratios of these isotopes is not fully known, the amount of these inventories to be abandoned is uncertain.

The residuals in the WMA C tanks amount to 524,000 Curies, in a residual volume of 67,000 gallons (equal to 1,220 fifty-five-gallon drums or 8,960 cubic feet). Conceptually, the DOE plan is simply one of leaving 1,220 fifty-five-gallon drums of HLW in shallow burial. Granted the tanks' walls are thicker, but the abandoned pipelines are somewhere in between the tank walls and a 55-gallon steel drum's wall in thickness. Both are "single-shell". As with a 55-gallon drum, there'll be no grout underneath the tanks.

According to the DOE, "More than 70,000 containers of this waste (sometimes referred to as suspect TRU waste) were stored under a layer of dirt in the 200 Area Low-Level Burial Grounds of the Hanford site, in the 1970s and 1980s. The intention was to retrieve the waste (which is why sometimes it is also referred to as retrievably-stored waste) at a later date when a national repository was established to accept transuranic waste" (<https://www.hanford.gov/page.cfm/TRU#tru1>). There is a major difference between drums and tanks of course. The abandoned tanks will also contain grout monoliths, making retrieval impossible (US DOE/Hanford photo next page).



Accidental criticality: Nonradioactive chemicals play an important role in maintaining the safety of residual plutonium in tanks. Plutonium has a significant spontaneous fission rate, and a low critical mass. Critical mass is the minimum mass required to initiate a spontaneous nuclear criticality, which is very highly undesirable. Materials such as iron and cadmium maintain the plutonium in tank solids below the criticality safety limit (CSL) of 2 grams of plutonium per liter of waste solids (Westinghouse 1995). Actual maximum plutonium activity in the 100 and 200 series tanks is 0.35 to 0.70 g/L; up to 35 % of the CSL (Bratzel 1996, CSL also stated as 2.6 g Pu/L). Chemical washout from grout that removes cadmium or other neutron absorbers, or concentrates plutonium, can lead to unanticipated criticalities, which would create a catastrophic failure of containment.

Chemical crystallization at the grout-sediment interface is one example of a potentially plutonium-concentrating mechanism. The DOE WIR evaluation (US DOE 2018, p.55) notes that, “In most instances, adsorption appears to be the controlling geochemical process, but neutralization of acid waste by the alkaline sediment and neutralization of basic tank waste can cause precipitation of some contaminant species within the sediment pores.” This means that plutonium leached from grout in the tanks would precipitate in the sediment pores immediately adjacent to the tanks, resulting in preferential deposition of plutonium. The grout solids, which serve to keep plutonium activity below the CSL, would be left behind. The WIR further notes on p. 55 that, “Outside the zone of pH neutralization, adsorption is considered to be the dominant retardation process in the

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vadose zone.” This adsorption zone outside of the neutralization zone where plutonium can recrystallize would reinforce the tendency to concentrate plutonium residues in a small volume; again driving plutonium activity to reach or exceed the CSL, and encouraging the initiation of an accidental criticality.

In total, it is estimated that 500 to 1000 kg plutonium remains in the 100 and 200 series tanks (Ibid). In 1951 Hanford experienced an accidental criticality in a water solution of plutonium nitrate, where the system contained a total of 1.15 kg of plutonium-239 (LANL 1967). The laboratory building involved was never fully remediated, but was eventually abandoned. In comparison, tank C-102 is estimated to contain about 1.02 kg of plutonium-239 (2018 Oregon DOE data).

At Hanford, nonradioactive iron compounds in tank solids provide an important safety buffer against exceeding the CSL. However in some tanks, such as C-101, waste streams were disposed that had iron to plutonium-239 ratios of less than 5:1 (iron:plutonium-239). Differential loss of iron compounds would significantly impact the safety factor below the criticality safety limit for this waste solid in C-101.

On average in Hanford waste tanks, there are higher concentrations (on a molar basis) on plutonium in the solids versus the supernatant liquids in tanks. Tank C-110 has nearly a 100X greater plutonium concentration in solids compared to liquids. It is the solids left behind that will account for much of the abandoned residuals in tank wastes, meaning leaving a 4% residual of solids potentially leaves much more than 4% of a tank’s plutonium in shallow burial. Tank liquids will be readily removed; most of these have plutonium concentrations between 10^{-6} and 10^{-9} molar. Tanks solids are most likely to be in the residual; these are 10^{-4} to 10^{-6} molar, with more than two orders of magnitude greater plutonium concentration.

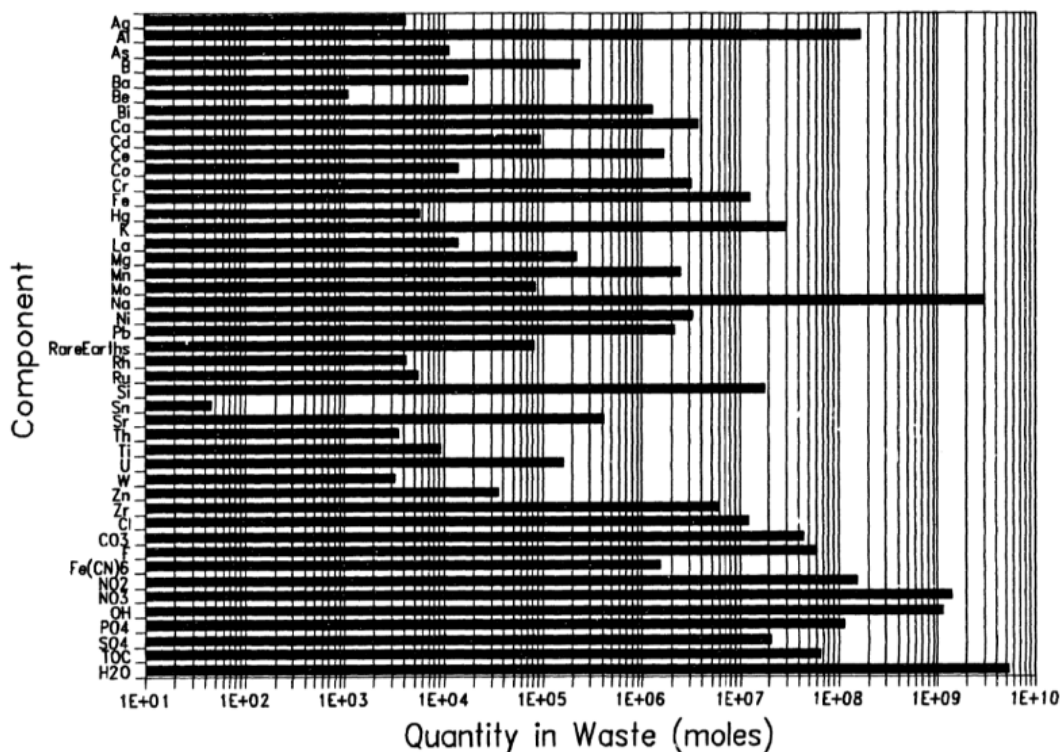
Washington Dept. of Ecology commented on the criticality risks associated with DOE proposal, noting that DOE assumed that the single sample retrieved (from HLW tanks) might not be representative of the entire volume of residual waste. DOE stated that the C-200 tanks were presumed to have a similar history and waste types; yet, when sampled, there were considerable differences among some of these tanks. Given that result, WA DOE questioned the uncertainty associated with the use of waste type templates and how is it addressed in DOE’s [plutonium] inventory estimates, given that these template values were derived from models (WA Ecology 2017).

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A summary of the chemical constituents of tank wastes at Hanford is in Figure 1 (below). This is from PNNL 2015, Fig. 3-1, citing Delegard et al, 1994 and based on Boomer et al. 1993.



In addition to these long-lived isotopes, Hanford has a large inventory of short half-life (heat generating) isotopes such as cesium-137, strontium-90 and cobalt-60. Some of these were removed from tank waste in past waste fractioning programs. These remaining isotopes can generate much higher in-situ heat loads than plutonium and technetium, because they decay in 5 to 30 years, rather than thousands of years. This presents a physical hazard to the integrity of the grout monolith proposed for the tanks.

Shallow land burial of HLW and vadose zone chemistry: There are technical barriers to and potential impacts from leaving HLW in shallow land burial. These wastes, regardless of how they are renamed, are abandoned within the vadose zone for groundwater; meaning the unsaturated zone above the groundwater table. Vadose zone chemistry then contributes to contaminant migration (or in the case of plutonium or uranium-235, reconcentration or preferential segregation above the CSL).

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Leaving HLW near the surface of the ground at Hanford creates some unavoidable conflicts with the local environment. Shallow-buried materials lie in the portion of the soil where any groundwater percolates downward over time into the deeper, fully saturated, aquifer. This creates an obvious transport mechanism for any leached isotopes, including transuranic (heavier than uranium) isotopes of plutonium, americium and neptunium, that will eventually reach the Columbia River or potentially some other future groundwater user. (Most Americans rely at least in part on groundwater for drinking or agriculture).

Hanford's semiarid climate also creates conditions where any isotopes leached from grout will arrive at the sediment interface at their maximum concentration. This means that the initial concentration of leached radioactive TRU in the unsaturated soil will be limited only by its solubility in water. Radioactivity dissolved in groundwater will always begin at the highest theoretical activity, with very little dilution through the unsaturated zone (PNL 1995 p. 2.3). This condition creates a "solubility-controlled" release model, where the source concentration at the tank farm does not decline over time; this is not advantageous.

The chemistry of Hanford's soils also creates conditions where the pH (acidity) and redox potential (ability to oxidize, e.g. rust in the case of iron) change very little. That means that further transport through the unsaturated zone in the upper soils will not be able to chemically "fix" or alter the radioisotopes. In other climates pH and redox-dependent processes can slow the transport of contaminants, but these processes are nearly absent at Hanford (Ibid). This creates a conservative (no chemical losses) diffusion process, where groundwater contaminant concentration is only reduced by dilution as the groundwater encounters fresh uncontaminated sediment, groundwater or Columbia River water.

The use of homogeneous groundwater models instead of multilayer heterogeneous modeling is insufficient to provide a realistic assessment of the time to breakthrough of residual tank wastes into the Columbia River. As noted in the draft WIR evaluation, "Hydraulic conductivity values reported for the aquifer in this area vary considerably, ranging from 0.04 (silt lenses within the sandy gravel) to 6,900 m/day." This is an unusually wide range of hydraulic conductivity values, and it demonstrates the heterogeneous nature of the aquifer. No known homogeneous hydrogeologic model can accommodate such a wide range of hydraulic conductivities. The high hydraulic conductivity values are consistent with the short transit times for contaminants leaving the WMA C and arriving at the Columbia River. Given that HLW is already in the vadose zone and moving into the Columbia River, a more realistic multilayer heterogeneous groundwater model is required.

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The estimated hydraulic gradient, the driving force behind groundwater flow velocity, is a relatively low 1.0×10^{-5} to 2.0×10^{-5} m/min, but this gradient has varied greatly in Hanford's history (US DOE 2018), especially when waste waters were disposed of directly into the vadose zone. Any unexpected rainfall, flood event, wastewater discharge or even dam or flood control structure release would dramatically raise the hydraulic gradient and reduce the elevation difference between abandoned tank waste and the water table. Combined with the high hydraulic conductivities, a disastrous release of contaminants could move into the Columbia River. Notably, even easily foreseeable future land uses like irrigated agriculture would introduce water to the area, increasing the hydraulic gradient, and again potentially causing mounding of groundwater.

Diverse future land uses were addressed in the WA Ecology comment; "Table 2-1 shows only two exposure scenarios for WMA C (tap water and groundwater protection). Considering the numerous source terms at WMA C and possible contaminant transport pathways, other exposure scenarios (in addition to tap water exposure and groundwater ingestion) should be examined and summarized in a similar table (e.g., exposure to soil, surface water, sediment, and air by human and ecological receptors)."

Future events notwithstanding, WA Ecology noted the current existing potential for irregular recharge or spikes in its 2017 comments saying, "In addressing recharge, not only do you focus on natural recharge and ignore artificial recharge, but recharge is applied as a yearly average which does not represent reality. Natural recharge occurs primarily in the winter months (Nov.- Feb.) when there is no evapotranspiration—especially on gravel covered tank farms. Fig. 9-6 clearly shows the sensitivity of recharge to the results."

The radioisotopes of concern at Hanford move in varying velocities and even directions. Data collected from groundwater show that Tc-99, Cs-137, Ru-106, Co-60 and chemical contaminants in the vadose zone underneath WMA-C have not moved in synch (WA Ecology 2017). The nonuniform nature of the aquifers at Hanford obviously contributes to the differences in the rates and directions of contaminant spread. In fact, the directions of migration for radioisotopes around WMA C have been in flux, including the time since wastewater discharges stopped in the 200 Areas in 1995. Changes in water table heights associated with changing water discharge rates will cause contaminants from other disposal areas at Hanford to move toward the WMA C location. Together these nonuniformities create large uncertainties in the ability to predict when radioisotope contamination from abandoned HLW would reach the Columbia River.

WA Ecology (2017) addressed these nonuniformities when it commented that, "The use of an EHM is a modeling convenience that represents an oversimplification of a highly

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heterogeneous system and fails to capture the various facies and characteristics of highly heterogeneous glaciofluvial sediments. This should not be the base case. These are general characteristics of the stratigraphic units within the Hanford formation. What is omitted is the presence of numerous, thin lamina of finer grained material that affect the flux and direction of infiltration and may have played a significant role in the transport of fluids through the vadose zone.”

The pH and redox conditions in the grout itself are a different issue than for soils. The grout monolith must provide near- and long-term high pH and chemically reducing capabilities to maintain the radionuclides and toxic heavy metals, such as technetium and neptunium, in their least mobile chemical forms, i.e., the lower-oxidation state or reduced form (Buice et al., 2005).

Hanford’s HLWs also contain nonradioactive but potentially reactive chemical compounds. These chemical compounds have created important health and safety issues for Hanford Tank Farm workers. (Reference: Hanford Chemical Vapors: Worker Concerns and Exposure Evaluation, CH2M-32068-FP Revision 0, Dec. 2006) It is not clear how these chemical constituents, including liquid organic materials and ammonia, would impact the formation of high-quality cured grouts. This lack of clarity is a result of insufficiency of the evidence base about the conditions under which grouts might fail to set, given the complex chemistry and radiochemistry of tank wastes.

There is no evidence-based method for even estimating the potential failure rate of grouting based on failure to set due to waste chemistry. It is not feasible to pilot test a grouting treatment process facility that realistically simulates disposition of materials formerly classified as HLW. The actual chemistry of this processing is not known. Examples of chemical-induced failure to set include:

“We have used a composition for Type 1 Portland cement to represent the 63 tons of cement that was added to BY-105 in 1972. This cement was added in an attempt to sequester the residual fluids within BY-105 tank, which was a suspected leaker. Evidently, the cement did not set in the high-caustic, high-salt liquid and no further additions of cement were made to this or any other tank. Type 1 Portland cement is 46 wt% [weight percent] Ca, 10 wt% Si, with the balance being oxygen, Al, Fe, Ca, Mg, sulfate, and water. Since the basic constituent of cement is calcium silicate, we are able to adapt it to our composition vectors. We assume that the cement was added with a specific volume of 0.13 kgal/ton, for a total amount of 8 kgal added to BY-105. As far as we know, this is the only addition of cement to any tank at Hanford.”
Reference: Stephen F. Agnew (1996) LANL, Hanford Tank Chemical and Radionuclide Inventories: HDW Model Rev. 4.

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TRU, technetium-99, iodine-129 and neptunium: The 2017 DOE Status Report (US DOE 2018b) states on p. 1-17, “The inventories of technetium-99 [technetium-99, half life of 211,000 years by beta decay] and iodine-129 [iodine-129, half life 15.7 million years by beta decay] as representative mobile constituents were used to evaluate potential impact of the PUREX tunnels.” Nevertheless, the WIR neglected to address the large inventory of Tc-99 and other chemicals that reside beneath the tanks (<https://www.nap.edu/read/11618/chapter/8#63>). This also applies to wastes from other areas (such as the B-complex in the northwest corner of the 200 East Area) where contaminants are now migrating into the WMA C area due to dissipation of the former groundwater mounds underneath effluent discharge points.

Prior US DOE documents (such as the 2012 Final Hanford Tank Closure and Waste Management Environmental Impact Statement, TC & WM EIS) note that the eventual long-term equilibrium activity of iodine-129 and technetium-99 in the Columbia River is a function of the percent removal of HLW from the tank farms (Sec. 3, DOE responses to public comments, TC & WM EIS).

The plans to abandon tank residuals containing these isotopes fails to consider that nuclides such as technetium-99 and iodine-129 exist at other waste sites on the Hanford Plateau. For example naval wastes disposed of at Hanford contain both nuclides, including 2.8 Curies of technetium-99 and a poorly characterized (but smaller) amount of iodine-129 (3/5/2010 letter from T. Mueller, Naval Systems Command to US DOE ORP).

WA Ecology (2017) noted that multiple individual monitoring wells for groundwater observation at Hanford contain these and other isotopes, along with hazardous chemical constituents. Some of these are outside of known major plume areas. These groundwater constituents, both radioactive and hazardous, would persist over and above those released from the abandoned waste tanks. Some monitoring wells, such as well 299-E27-155 at WMA C contain all three isotopes, technetium-99, iodine-129 and plutonium-239.

This same well contains the hazardous chemical constituents cyanide, hexavalent chromium and nitrate. These chemical constituents can dissolve and/or change the chemical form of plutonium to make plutonium-239 more mobile in groundwater. Plutonium nitrate is far more soluble in water than plutonium oxide, for example. The presence of liquid phases in tank waste containing cyanide and nitrate is a concern because these chemical-laden liquids could potentially separate plutonium from the solid sludges, a condition that could reduce the margin of safety against accidental criticalities. The flowing liquids with nitrates and cyanides can cause plutonium to recrystallize at the

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boundary between grout and groundwater, potentially concentrating plutonium that is precipitated (just as a stalactite is precipitated from dripping salty liquids in caves).

Other wells at WMA C contain tritium and uranium. Uranium in residual abandoned tank waste will also contribute to accidental criticality risk, if the uranium is in the form of its fissile isotope, uranium-235. According to WA Ecology's 2017 comments, "Tank waste contaminants in groundwater may be transported to the river and impact receptors in surface water and sediment in the Columbia River. No mention is made of the evaluation of wastes that have been released to the soil and groundwater arising from WMA C."

Summary of Part 2

The long-term integrity of grout is untested.

Grouting will not effectively bind residual HLW. Hanford's climatic and soil environments are particularly harsh for grout monoliths.

Grout performance and the rate of groundwater flow through the grout monolith, is critically dependent on near-perfect, fracture-free, installation.

The performance assessment does not use a reasonable time frame. Other sources of radioisotopes are not included in models. Models assume no significant decline in performance over time and no nonuniformity over space.

Grouting of tank wastes is irreversible, preventing future remediation of residuals.

Reasonably foreseeable future land uses that could affect groundwater hydraulic gradients and exposure scenarios are not addressed.

Inadvertent criticalities are not addressed.

Future use scenarios assume institutional controls or unrealistic land uses, such as no anthropogenic disturbance of a scale greater than drilling (e.g. constructing building foundations). Climactic scenarios exclude dam failures, Columbia River flooding, concentrated rainfall events – especially in cooler weather, glacial flooding/damming.

References for Part 2

Bratzel et al. (1996) *Resolution of the nuclear criticality safety issue for the Hanford site high-level waste tanks*, <http://www.wmsym.org/archives/1997/sess32/32-02.htm>

DOE Manual 435.1-1, Radioactive Waste Management Manual, Change 1. U. S. Department of Energy, Washington, D.C., June 19, 2001.

LANL (1967) *A Review of Criticality Accidents*,
<https://permalink.lanl.gov/object/tr?what=info:lanl-repo/lareport/LA-03611>

PNL (1995) R. J. Serne et al., *Leach Test of Cladding Removal Waste Grout Using Hanford Groundwater*, Hanford Grout Technology Program, Pacific Northwest Laboratory, Richland, WA

NRC (1995) National Research Council, *Technical Bases for Yucca Mountain Standards*. Washington, D.C.: National Academy Press. ISBN 0-309-05289-0.

PNNL (2014) R. J. Serne, B. M. Rapko, *Technetium Inventory, Distribution, and Speciation in Hanford Tanks*, PNNL-23319

PNNL (2015) C. H. Delegard, S. A. Jones, *Chemical Disposition of Plutonium in Hanford Site Waste Tanks*, PNNL-23468, revision 1

WA Ecology (2017) State of Washington Department of Ecology Review and Comments of Appendix 1 Performance Assessment for Waste Management Area C (WMA C) Documents

Westinghouse (1995) C. A. Rogers, *Criticality Safety of High-Level Tank Waste*, WHC-SA-2748-FP

Part 3. Conclusions: Did US DOE meet its burden of proof?

The first question as was, “Yes or no, is residual nuclear waste left in Hanford tanks still High-Level Waste?” Certainly under Washington and federal law the answer is yes. Abandoned reactor and reprocessing waste is still High-Level Waste.

(1) The DOE has not proven that the best available (or foreseeable) technologies cannot remove the residual tank waste from WMA C tanks. The data provided by DOE don’t even prove that the limited efforts employed to date have exhausted their utility; no further technologies have been explored beyond the initial low-tech washing methods.

(2) DOE’s assertion that, “*Removing residual waste from tanks would cause greater human radiation exposure and increased leaks to the environment compared to abandoning a fraction of the HLW.*” Is not supported by data. The clear and documented uncertainties in DOE’s analysis of the magnitude and timing of leaks from the residual abandoned HLW make it impossible to quantify the relative risks. Some certain differences are that abandonment will create greater risks of accidental criticalities and will leave HLW in the vadose zone where it will ultimately reach the Columbia River. Grouting of residual HLW actually prevents the use of future remedial efforts and foreseeable waste retrieval technologies. A grout/waste/tank structure monolith is irretrievably difficult to recover, compared to the actual HLW itself. Grouting for example, would have made the 1968 and 1969 retrieval campaigns of strontium-90 and cesium-137, completely impossible.

(3) DOE incorrectly describes the abandoned high-level waste as inconsequential to both public and environmental health and safety. “Inconsequential” is not a description supported by quantitative data or the law. Comments by WA Ecology and data from US DOE’s own analyses show that the residual HLW will exceed applicable legal standards before the expiration of the required closure period of 10,000 years, and in fact, exceeds these required quantitative levels already.

Attachment A

Hanford Challenge/Natural Resources Defense Council

10/29/18

(4) DOE asserts that putting cement over this waste will isolate the waste for 10,000 years. However, grouting efforts could potentially fail at the time of installation, with significant consequences for public health and for the environment, particularly for users of the Columbia River and to an even greater degree, First Nation stakeholders. Migration from WMA C to the Columbia River could take as little as 10 years, even assuming that no accidental criticality is ever initiated.

(5) Abandonment will not allow cleanup milestones to be met in a more timely fashion. A more accurate admission would be that abandonment would allow cleanup milestones to be defaulted in a more timely fashion.

Attachment A

Hanford Challenge/Natural Resources Defense Council

10/29/18

Biography, M. Kaltofen, PhD., PE, (civil, MA)

1. I am a Massachusetts-licensed civil engineer experienced in investigating the environmental fate and transport of petroleum, hazardous and radioactive materials. I received a doctorate in civil engineering in 2015; my research focused on investigation of nuclear releases to the environment.
2. I have tracked radioactive contamination at nuclear facilities since before 2004. This includes field-work and analysis in the United States, Middle East, Russia, India, Japan, Ukraine, the United Kingdom and the European Union.
3. I have published articles on the subject, including but not limited to my dissertation, and including lectures prior to receiving my PhD, was invited to lecture and to investigate in institutions ranging from Chelyabinsk School of Law, Chelyabinsk Oblast, Russia, University of Washington, Loyola University, Tufts University, Dartmouth-Thayer School of Engineering, President's session of the American Public Health Association and Massachusetts Institute of Technology.
4. I currently hold a two-year appointment as an affiliate research engineer at Worcester Polytechnic Institute, advising and over-seeing undergraduate nuclear science and engineering research on environmental radioactivity related to ongoing projects in Fukushima, Japan, Hanford, WA, and Chernobyl, Ukraine.
5. I regularly peer-review scientific articles on environmental radioactivity, and peer-review or judge/evaluate major grant proposals for the MacArthur Foundation. I have also participated, been invited or chaired multiple federal environmental review panels including the Environmental Protection Agency committee on accreditation of environmental laboratories, the DOD advisory panel to the US Army Soldier Systems Command, and nuclear waste treatment evaluation panel at Hanford Nuclear Reservation.
6. I am the owner and operator of Boston Chemical Data Corp. I have been offering expert opinion on matters of contamination and transport of contamination since 1989. My experience and training can be found at: <http://www.bostonchemicaldata.com/cv.html>
7. The bulk of my experience and skill set comes from actually being a boots on the ground engineer, including sampling and assessment in such places as radioactively-contaminated zones of Fukushima Prefecture in Japan, British Nuclear Fuels site in Cumbria, UK; depleted uranium-contaminated areas of the Serb Republic, radium at the Henry Hub Natural Gas distribution facility in Louisiana, nuclear worker exposures to radiation at the Hanford Nuclear Reservation (WA), Los Alamos (NM) National Laboratory and Idaho (ID) National Laboratory; uranium mining wastes at the Spokane Tribe of Indians sites in Wellpinit (WA), and the former Love Canal in Niagara Falls, NY,

Prepared by:

Marco Kaltofen

Marco Kaltofen, PhD., PE (civil, MA), C. NSE

Oct. 29, 2018

Boston Chemical Data Corp.
2 Summer St., Suite 14, Natick, MA 01760

Affiliate Research Engineer
Nuclear Science and Engineering Program
Dept. of Physics
Worcester Polytechnic Institute
Worcester, MA
kaltofen@wpi.edu

Attachment B



**A Communication from the Attorneys General of the States of
Idaho, Oregon, South Carolina, and Washington.**

August 28, 2003

By Facsimile

The Honorable Bill Frist
Majority Leader of the U.S. Senate
U.S. House of Representatives
Washington, D.C. 20515

The Honorable Tom Daschle
Minority Leader of the U.S. Senate
U.S. House Representatives
Washington, D.C. 20515

The Honorable J. Dennis Hastert
Speaker of the House
U.S. House of Representatives
Washington, D.C. 20515

The Honorable Nancy Pelosi
Democratic Leader
U.S. House of Representatives
Washington, D.C. 20515

Dear Senators Frist and Daschle and Representatives Hastert and Pelosi:

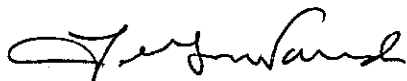
We were deeply troubled to learn that the Department of Energy recently submitted to Congress proposed legislation to amend federal law governing the management of our nation's high-level radioactive waste. The Department's proposal, submitted via an August 1, 2003 letter from Energy Secretary Spencer Abraham to Speaker Hastert, would amend the Nuclear Waste Policy Act, the West Valley Demonstration Project Act, the Atomic Energy Act, and the Energy Reorganization Act of 1974, to give the Department blanket discretion to exempt such wastes from long-standing management and disposal requirements.

The Department's stated reason for these changes is an Idaho Federal District Court decision that the Department contends would require fundamental changes in its plans for retrieval, treatment, and disposal of defense high-level radioactive waste. Our states participated as *amici curiae* in the case, and we strongly disagree with the Department's characterization of the effect of the court's decision. In our view, amendment of federal law is wholly unnecessary to remedy the defects the court identified in the Department's internal policies. Moreover, enactment of the proposed legislation would merely serve to do what the states objected to in the first instance by giving the Department unbounded discretion to reclassify high-level radioactive waste. The broad grant of discretion to the Department of Energy proposed by the legislation would not ensure protection of human health and the environment.

Page 2

Our respective clients jointly wrote to Secretary Abraham to lay out the states' concerns on these issues. We have attached a copy of the states' letter for your information. We add our voices to those of our clients: amendment of the Nuclear Waste Policy Act and other Federal law is unnecessary and unwise.

Very truly yours,



LAWRENCE G. WASDEN
Attorney General of Idaho



HARDY MYERS
Attorney General of Oregon



HENRY McMASTER
Attorney General of South Carolina



CHRISTINE O. GREGOIRE
Attorney General of Washington

Attachment B

August 12, 2003

The Honorable Spencer Abraham
U.S. Department of Energy
1000 Independence Ave. SW
Washington, DC 20585

Dear: Secretary Abraham:

The Department of Energy and states affected by DOE facilities face technical, political, and fiscal challenges as we decide how to treat and dispose of high-level waste created by Cold War-era reprocessing. It will take our combined efforts to devise and implement responsible, effective policies that protect human health and the environment as well as respect taxpayer dollars.

We write to express concern with DOE's current strategy for addressing this key issue. DOE's recent proposal to reopen the Nuclear Waste Policy Act runs counter to our mutual interests.

Fortunately for our shared high-level waste challenge, reasonable solutions exist within the current law without undermining public trust in DOE's efforts to properly manage nuclear waste. DOE already has the tools it needs to address this issue by making internal policy changes; it doesn't need a sledgehammer to do the job.

DOE's recent statements to Congress appear to exaggerate the impacts of the recent judicial decision on high-level waste classification. The federal court decision only confirmed long-standing national policy, which requires disposal of high-level waste in a geologic repository while allowing properly treated, less radioactive wastes to be disposed elsewhere.

The court's ruling allows DOE to proceed with retrieval and treatment of liquid waste from tanks at Hanford, Savannah River and INEEL. If the wastes in question are not highly radioactive following treatment, DOE has the ability now to develop a classification strategy to qualify these wastes for management, including disposal, outside a high-level waste repository. What the court rejected was giving DOE free rein to override national policy as expressed in the Nuclear Waste Policy Act.

The States of Idaho, Oregon, South Carolina and Washington participated in the lawsuit, not as parties, but as friends of the court to protect our interests in safe, cost-effective, timely cleanup and responsible use of repository capacity. As you may know, last November the states made a concrete proposal to resolve these issues outside of litigation, outlined the legal and practical risks associated with continuing to litigate this matter, and offered to enter into mediation with the parties. DOE rejected our efforts and chose to litigate instead.

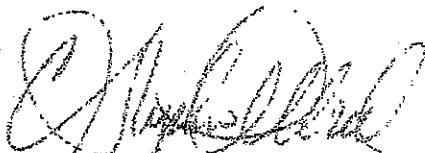
Today we renew our offer to work with DOE to develop a waste classification strategy that ensures protective, cost-effective, and timely disposal of the nation's defense high-level radioactive waste in a manner consistent with the court's opinion.

We urge to you to reconsider your strategy and to work with the states on a reasonable solution within the framework of existing law. By doing so, we can do the job right without jeopardizing progress on repository development, slowing down cleanup or undermining public trust in our efforts.

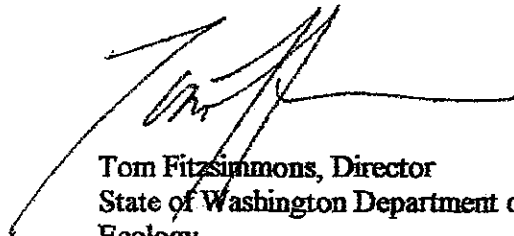
Letter to The Honorable Spencer Abraham

Page 2

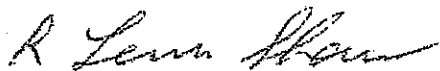
August 12, 2003



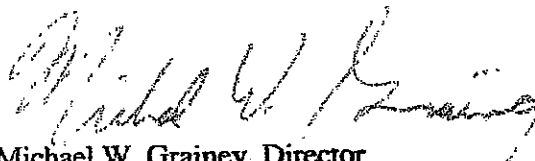
**C. Stephen Alred, Director
State of Idaho Department of
Environmental Quality**



**Tom Fitzsimmons, Director
State of Washington Department of
Ecology**



**R. Lewis Shaw, Deputy Commissioner
South Carolina Department of Health And
Environmental Control**



**Michael W. Grainey, Director
State of Oregon Department of Energy**

**Cc: Governors, Attorneys General and Congressional Delegations of Idaho, Oregon, South
Carolina, Washington**

Attachment C

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF IDAHO

_____)
Natural Resources Defense Council;)
Snake River Alliance; Confederated Tribes)
& Bands of the Yakama Nation; Shoshone)
Bannock Tribes,)
)
	Plaintiffs) Case No. 01-CV-413
) (BLW)
	v.)
)
Spencer Abraham, Secretary, Department)
of Energy; United States of America,)
)
	Defendants)
_____)

DECLARATION OF DR. THOMAS B. COCHRAN

I, Thomas B. Cochran, do hereby swear that the following is true to the best of my knowledge.

1. I reside at 4836 30th Street North, Arlington, Virginia 22207. I am the Director of the Nuclear Program and hold the Wade Greene Chair for Nuclear Policy at the Natural Resources Defense Council, Inc., where I have worked since April 1973. I have been involved with nuclear energy and non-proliferation issues for over 30 years, and have worked extensively on nuclear weapons related issues since 1979. As a member of the U.S. Department of Energy’s (“DOE’s”) Energy Research Advisory Board (1978-1982), Environmental Management Advisory Board (1994 to 1997), and the Nuclear Energy Research Advisory Committee (1998-present), I have participated in the development and implementation of DOE’s nuclear and environmental management programs. I received a Health Physics Fellowship from the Atomic Energy Commission,

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enabling me to obtain a masters degree in physics from Vanderbilt University in 1965. In 1963, I received applied health physics training at DOE's Oak Ridge National Laboratory working at the Oak Ridge Pilot Reprocessing Plant. My masters degree thesis was in the field of radiation chemistry. Under a NASA fellowship and while serving as Vanderbilt's Radiation Safety Officer, I received a doctorate in physics from Vanderbilt University in 1967. During this period I was also a Guest Research Associate in the Physics Department of DOE's Brookhaven National Laboratory, studying synchrotron radiation shielding problems. From 1967-69, I taught undergraduate and graduate physics and mathematics at the U.S. Naval Postgraduate School in Monterey, California. I am the author of *The Liquid Metal Fast Breeder Reactor: An Environmental and Economic Critique* and co-author of several books on nuclear weapons. I am a Fellow of the American Association for the Advancement of Science and the American Physical Society, and a member of the Health Physics Society, the American Nuclear Society and the Federation of American Scientists. I received the American Physical Society's Szilard Award (1987) and the Federation of American Scientists' Public Service Award (1987).

2. The purpose of this declaration is to document and explain pertinent facts regarding high-level radioactive waste ("HLW"). To summarize, it is a universal, long-held scientific judgment that HLW must be disposed of in a deep geologic repository to protect human health and the environment. HLW is produced in the reprocessing of spent nuclear fuel,¹ and historically reprocessing activities have occurred in the United States in

¹ Spent nuclear fuel is fuel that has been permanently withdrawn from a nuclear reactor after irradiation, the constituent elements of which have not been separated by reprocessing.

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a number of locations largely for the purposes of nuclear weapons production and reactor fuel management. The specific radiological characteristics of HLW produce hazards associated with both acute and chronic exposure to the ionizing radiation. Currently, large volumes of HLW are found in interim storage at the Department of Energy's ("DOE's") Hanford Reservation, Savannah River Site ("SRS") and the Idaho National Engineering and Environmental Laboratory ("INEEL"), awaiting ultimate geologic disposal—at the Yucca Mountain geologic repository in the state of Nevada, if it is licensed to operate. At issue in this case is the fraction of HLW currently in interim storage which the DOE will seek to dispose of outside of a deep geologic repository under the unlawful authority of DOE Order 435.1.

Scientific judgments about the necessity of deep geologic burial of HLW

3. Because of the high toxicity of high-level radioactive waste, in its 1957 report, prepared at the request of the U.S. Atomic Energy Commission, the National Research Council of the U.S. National Academies "endorsed the concept of geological disposal—placing high-level waste (HLW) in a carefully selected deep underground formation, where it would remain isolated from human beings and the environment long enough for the radioactivity to decay to near natural background levels." [National Research Council, *Disposition of High-Level Waste and Spent Fuel: The Continuing Societal and Technical Challenges*, Washington, D.C.: National Academy Press, 2001, p. ix.] In 1990 the National Research Council reaffirmed this position when it stated, "There is strong worldwide consensus that the best, safest long-term option for dealing with HLW is geological isolation. . . . Although the scientific community has high confidence

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that the general strategy of geologic isolation is the best one to pursue, the challenges are formidable.” [National Research Council, *Rethinking High-Level Radioactive Waste Disposal*, A Position Statement of the Board on Radioactive Waste Management, Washington, D.C.: National Academy Press, 1990, p. 2.; quoted in National Research Council, *Disposition of High-Level Waste and Spent Fuel: The Continuing Societal and Technical Challenges*, Washington, D.C.: National Academy Press, 2001, p. x.] This position was also adopted by the U.S. Congress and embodied in the Nuclear Waste Policy Act of 1982.

What is “High Level Radioactive Waste”?

4. According to Congress,

“The term “high level radioactive waste” means—

(A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and

(B) other highly radioactive material that the [Nuclear Regulatory] Commission, consistent with existing law, determines by rule requires permanent isolation.” [42 U.S.C. 10101(12)]

5. Thus, HLW is defined in terms of the source of the material rather than the hazardous characteristics.

What is “Reprocessing”?

6. **“Reprocessing”** is the act, or process, of separating the ingredients in irradiated nuclear reactor fuel and target materials into constituent parts or streams. The constituent part or streams are in the form of product streams and waste streams. Examples of products or product streams are: (1) plutonium and tritium recovered for the manufacture of nuclear weapon components; (2) radioactive isotopes used in military and civil applications; (3) unused highly enriched uranium recovered from naval and research reactor fuel for the purpose of recycling as fresh production reactor fuel; and (4) plutonium and unused uranium recovered from irradiated civil reactor fuel for the purpose of reusing (recycling) into new reactor fuel. In each of these cases there is also by-product production of radioactive waste.

What is “highly radioactive material resulting from the reprocessing of spent nuclear fuel”?

7. In a nuclear reactor it requires the fissioning of roughly one gram of fissionable material to produce one megawatt-day of energy output. Thus, when a large reactor (producing several thousands of megawatts of thermal power) has operated for only a short period of time—in a matter of days—kilogram quantities of fissionable fuel (typically uranium or plutonium) will have fissioned, and as a result, kilogram quantities of highly radioactive fission products will have been produced. Once separated from product materials by reprocessing this by-product waste material is the “highly radioactive material from reprocessing spent nuclear fuel.” It includes not only the radioactive fission products, which are produced in the reactor as the fuel undergoes

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nuclear fission, but also the non-product radioactive isotopes that are produced when neutrons are absorbed in fuel and target materials in the reactor.

The High-Level Wastes in the Tanks are Extremely Toxic.

8. In 1995, the Oak Ridge National Laboratory for DOE compiled estimates of radioactivity of the high-level wastes in storage by site through 1995. The estimates are reproduced in Table 2 below.

Table 2. Radioactivity of HLW in storage by site through 1995

Site	Radioactivity (MCi)			
	Tank Waste		Capsules	
	Liquid	Solid	Sr	Cs
Hanford	68.5	123.3	44.9	101.2
INEEL	2.7	46.6		
SRS	214.6	287.6		
WVDP	24.05			

[DOE, *Integrated Data Base Report-1995: U.S. Spent Nuclear Fuel and Radioactive Waste Inventories, Projections, and Characteristics*, DOE/RW-0006, Rev. 12, December 1996, p. 52.]

9. These amounts have been reduced, in some cases by 15 to 20 percent due to radioactive decay, and by removals since 1995.

10. At SRS the dominant radionuclides in the tank wastes are strontium-90, its radioactive daughter yttrium-90m, cesium-137 and its daughter product barium-137m. As of the end of 1995, in the SRS tanks there were approximately 119 million curies (“MCi”) each of strontium-90 and yttrium-90m, 116 MCi of cesium-137 and 110 MCi of barium-137m. [DOE, *Integrated Data Base Report-1995: U.S. Spent Nuclear Fuel and Radioactive Waste Inventories, Projections, and Characteristics*, DOE/RW-0006, Rev.

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12, December 1996, p. 55.] By comparison the annual limits on intake by ingestion for a radiation worker to insure the workers dose does not exceed 5 rems per year is 0.0004 Ci of strontium-90 or 0.0001 curies (“Ci”) of cesium-137. [EPA, *Limiting Values of Radionuclides Intake and Air Concentration and Dose Conversion Factors For Inhalation, Submersion, And Ingestion*, EPA-520/1-88-020, September 1988, pp. 49 and 71] Thus, the waste tanks at SRS contain hundreds of billions of “annual limits on intake” for nuclear workers and tens of trillions of “allowable ingestion limits” for the general population. In its concentrated form the HLW in the tanks is very toxic. This is of course why Congress has required that all high-level radioactive waste be isolated in one or more deep geological repositories.

DOE Plans Permit Substantial Amounts of High Level Radioactive Waste to Be Left in the Tanks.

11. The total radioactivity in the 49 operating HLW tanks at SRS is estimated to be 420 million Curies (“MCi”).² If DOE reduced the amount of HLW in the SRS tanks to one to two percent of the existing waste (their draft waste removal goal for the tanks at SRS) such an amount is equal to 4-8 MCi. By comparison, the radioactivity in one normal fuel load of a typical commercial reactor is about 0.4 MCi.³ Therefore, if even just two percent of the HLW in the SRS tanks is reclassified as incidental waste and left

² Plaintiffs’ Complaint Att. 14, Pacific Northwest National Laboratory, Tank Focus Area.

³ That is, the amount Defendants will abandon is at least 10 times more than a typical commercial spent nuclear fuel load. Plaintiffs’ Complaint Att. 15, “Integrated Data Base Report—1994 (September 1995): U.S. Spent Nuclear Fuel and Radioactive Waste Inventories, Projections, and Characteristics” Oak Ridge National Laboratory DOE/RW-0006, Rev. 12 December 1996 at 27 and 219.

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in place, this is equivalent to the shallow land burial of approximately four to nine tons of spent nuclear fuel.⁴

12. The 49 remaining high level waste tanks at SRS contain about 420 MCi in 35 million gallons of HLW. [<http://www.pnl.gov/tfa/sites.stm>] In the Draft SRS EIS, DOE defined the removal of 98 percent to 99 percent of the total radioactivity and over 99 percent of the volume of high-level radioactive waste from these tanks as constituting “the limit of what is economically and technically practicable for waste removal” [DOE, SRS High-Level Waste Tank Closure, Draft EIS, DOE/EIS-0303D, November 2000, p. 2-3.] DOE removed from the Final SRS EIS, the paragraphs that were present in the Draft EIS that defined the amount of high-level radioactive waste DOE believed was “the limit of what was economically and technically practicable for waste removal” from the tanks. [Compare the Draft EIS pp. 2-2 to 2-3 with the Final EIS, pp. 2-2 to 2-3.] The Final EIS retained a paragraph that was present in the Draft EIS passage that begins,

Following bulk removal, DOE would remove a majority of the waste from the tanks and fill the tanks with material to prevent future collapse and bind up residual waste. . .
[Draft SRS EIS, p. 2-3 and Final SRS EIS, p. 2-3.]

13. Thus, DOE may leave substantially more than one or two percent of the high-level waste in the tanks.

⁴ For this calculation, we use the facts that (1) one typical nuclear fuel load for a typical reactor (*i.e.*, boiling water reactor) weighs about 319.9 kilograms (kg), (2) has a volume of 0.0864 m³ and (3) a radioactivity of 1-10 MCi/m³. For pressurized water reactors this value is about twice as high.

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14. In fact, NRC stated that most (37 of 51 tanks) of the reprocessing waste to be left in the SRS tanks will not satisfy Class C low-level waste requirements at 10 C.F.R. § 61.55, and this is only after relying on averaging the radioactivity of the abandoned waste with the near zero radioactivity of the bottom-most layer of grout. Plaintiffs' Complaint Att. 10, NRC Review at 14. NRDC has calculated that in order to meet Class-C guidelines for the abandoned waste in some of the tanks at SRS, upwards of about 100-fold dilution of the residual waste with reducing grout will be required. This calculation relies on NRC's statement that "between 0 and 31 inches of grout" will be required "to meet the Class C limits." NRC Review at 11. The SRS tanks are between 75 and 85 feet in diameter.⁵ In any case, 31 inches of grout will occupy a volume of between 85,000 gallons and 110,000 gallons. Assuming that approximately 1,000 gallons of HLW remains in the tank after closure, this implies up to 100-fold dilution of the HLW by the grout.

The Closed Savannah River Site Tanks

15. To date, two HLW tanks at SRS have been closed: tanks numbered 17 and 20. These tank closures relied on the incidental waste concept to reclassify the waste. The results of the tank closure process illustrate one possible result of implementing Order 435.1. In Tank 20 at SRS, 1,000 gallons of HLW remained after closure out of an initial fill of 22,000 gallons. Therefore 9 percent of the initial tank waste remained in

⁵ See Administrative Record at 33637 or Complaint Att. 18, "Industrial Wastewater Closure Plan for F- and H-Area High-Level Waste Tank Systems" SRS Rev. 1 July 10, 1996 (The administrative record version is missing every even-numbered page. Complaint Att. 18 supplies the relevant page.).

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Tank 20 by volume. The radioactive elements in the tank heel included selenium-79, technetium-99, carbon-14, iodine-129, plutonium (-238, -239, -240, -241 and -242), neptunium (-237), curium (-244 and -245), and tritium (hydrogen -3).

16. Process records indicate that approximately one-half kilogram of plutonium remained in the residual wastes in SRS tanks 17 and 20. *See* Attachment 1 (Tank Inventory Breakdown Spreadsheet for Tanks 17-20). Extrapolating this amount of plutonium per tank residue to all DOE HLW tanks implies that if other HLW tanks in the DOE complex are closed in a similar manner to SRS Tanks 17 and 20, approximately 100 kilograms of plutonium are slated for abandonment under the guidelines of Order 435.1. The actual amount of plutonium and other radioactive elements in or near the water table at SRS, Hanford and INEEL, however, is unknown and may be much higher since the volume permitted to be left under Order 435.1 depends on “the limit of what is economically and technically practicable for waste removal ... or meets alternative requirements DOE may set.”

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Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury, that the foregoing is true and correct to the best of my knowledge and belief.

Signed on the ___ day of January, 2002,

Thomas B. Cochran
Director, Nuclear Program and
Wade Green Chair for Nuclear Policy
Natural Resources Defense Council, Inc.

Attachment D

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF IDAHO

<hr/>)
Natural Resources Defense Council;)
Snake River Alliance; Confederated Tribes)
& Bands of the Yakama Nation; Shoshone)
Bannock Tribes,)
)
	Plaintiffs) Case No. 01-CV-413
) (BLW)
	v.)
)
Spencer Abraham, Secretary, Department)
of Energy; United States of America,)
)
	Defendants)
<hr/>)

SECOND DECLARATION OF DR. THOMAS B. COCHRAN

I, Dr. Thomas B. Cochran, do hereby swear that the following is true to the best of my knowledge.

1. My expertise and vita were presented in “Declaration of Dr. Thomas B. Cochran,” submitted to this court on January, 21, 2003 (“First Cochran Declaration”).

2. The purpose of this second declaration is to explain pertinent facts regarding high-level radioactive waste (“HLW”) and to inform the court of certain factual errors contained in the Declaration of Jessie Roberson (“Roberson Declaration”), Assistant Secretary, Office of Environmental Management, U.S. Department of Energy (“DOE”), in support of Defendants’ Motion of Points and Authorities in Support of Federal Defendants’ Cross-Motion for Summary Judgment and in Opposition to Plaintiff’s Motion for Summary Judgment, 5 March 2003 (“Defendants’ Cross-Motion for Summary Judgment”).

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3. The Roberson Declaration, in so many words, is a claim that the amount and concentration of radioactive waste that will be left in the HLW tanks is far less than what Plaintiffs assert, and moreover, by adding grout to the tanks, the residual HLW can be diluted to meet Class C limits and thereby qualify as low-level radioactive waste. Assistant Secretary Roberson's implication is that it will be safe to abandon the waste in place. I claim that: (1) the abandoned waste is HLW; (2) DOE has made no commitment to leaving only a small amount of HLW in the tanks; and (3) the HLW would not be thoroughly mixed with the grout under the DOE proposal and will therefore not be comparable to Class C low-level waste. Using DOE documents, I will explain my claims and refute those of Assistant Secretary Roberson.

THE DEFINITION OF HIGH-LEVEL NUCLEAR WASTE

4. In The First Declaration of Thomas B. Cochran, I noted that according to Congress,¹

“The term “high level radioactive waste” means—

(A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and

(B) other highly radioactive material that the [Nuclear Regulatory] Commission, consistent with existing law, determines by rule requires permanent isolation.” [42 U.S.C. 10101(12)]

¹ In Defendants' Cross-Motion for Summary Judgment at 3, Defendants' claim “this is his [Cochran's] interpretation of the term high-level waste.” In fact, it is not Cochran's, but Congress' definition. It is also the definition used by the Environmental Protection Agency in establishing environmental protection standards for the management and disposal of high-level radioactive waste. (*See* 40 CFR 191.02(h), reproduced at 50 FR 38084 September 19, 1985).

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5. The Nuclear Regulatory Commission's implementation of subpart (B) of the HLW definition is undisputed.

6. It is undisputed that under subpart (A) of the definition that HLW is defined at least in part by the source of the material, "the highly radioactive material resulting from reprocessing" *See* Defendants' Cross-Motion for Summary Judgment at 14, line 2 and at 15, line 1.

7. There is a dispute over whether covering the residual tank waste converts it into something other than HLW, or whether a "Waste Incidental to Reprocessing" determination by DOE makes the waste something other than HLW.

EXAMPLES OF HIGH-LEVEL WASTE

8. The definition of HLW at ¶ 4 above includes two example categories of HLW, namely, "liquid waste produced directly in reprocessing" and "any solid material derived from such liquid waste that contains fission products in sufficient concentrations."

9. The highly radioactive liquid wastes from reprocessing, introduced into HLW tanks for interim storage at Savannah River Site (SRS), Hanford Reservation, Idaho National Environmental and Engineering Laboratory (INEEL) and elsewhere, fall under the first example category, namely, "liquid waste produced directly in reprocessing."

10. The vitrified HLW, *i.e.*, the mixture of HLW and borosilicate glass in steel cylinders, produced at Savannah River Site (SRS) in preparation for shipment to the proposed geologic repository at Yucca Mountain, the capsules of cesium-137 and

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strontium-90 produced and stored at Hanford Reservation,² and the calcined waste stored at the Calcine Solids Storage Facilities at Idaho National Environmental and Engineering Laboratory (INEEL)³ are all examples of “solid material derived from such liquid waste that contains fission products in sufficient concentrations.”

11. There are other example categories of “highly radioactive material resulting from the reprocessing of spent nuclear fuel” that do not fall into either of the two example categories given after the word “including” in part (A) of the definition of HLW. These include, but are not limited to: (a) highly radioactive solid particles (e.g., non-soluble fission products) in suspension that accompanied the liquid waste when it is introduced into the tanks, (b) the precipitated highly radioactive solid particles in sludge in the HLW tanks, and (c) highly radioactive liquid wastes “derived from such liquid waste that contains fission products in sufficient concentrations” after the liquid has been removed from the tanks and treated. The categories (a) through (b) are well recognized components of slurry and sludge forms of tank HLW and are discussed further below. At present I am unaware of the existence of any HLW in category (c), but HLW in this category may result from future treatment of HLW removed from the tanks.

² See Attachment 1, DOE, Integrated Data Base Report-1995: U.S. Spent Nuclear Fuel and Radioactive Waste Inventories, Projections, and Characteristics, DOE/RW-0006, Rev. 12, December 1996, pp. 52-53 (“Att. 1, DOE IDB-1995”).

³ “The High-Level Waste Tank Farm [at INEEL] includes 11 underground stainless steel storage tanks used to store the radioactive liquid waste generated during the reprocessing of spent fuel and plant decontamination work. Most of the tank farm liquid has been calcined, reducing the volume and converting it to a more stable solid form. . . . Calcining achieved an eight-to-one volume reduction from liquid to solid. . . . Calcination reduced the volume of liquid radioactive waste generated during reprocessing and placed it in a more-stable granular solid form.” <http://www.inel.gov/facilities/intec.shtml>. See Roberson Declaration ¶ 6, Bergholz Declaration ¶ 12 and Att. 1, DOE IDB-1995 at 54)

EXAMPLES OF INCIDENTAL WASTE

12. There are a variety of materials that have been contaminated as a result of secondary contact with the highly radioactive wastes from reprocessing. These include, for example, laboratory items and contaminated clothing, tools, and equipment. For many years this type of waste has been referred to as “incidental waste.” The categories of incidental waste traditionally have been identified by a process akin to the “citation method” set forth in DOE Order 435.1.

HIGH-LEVEL WASTE SITE LOCATIONS

13. Defendants note that “[t]here are four principal locations in the United States where reprocessing wastes are located. These principal locations are SRS, INEEL, Hanford and the Western New York Nuclear Service Center.” Defendants’ Cross-Motion for Summary Judgment at 9, n. 13.⁴

14. As a result of reprocessing, large quantities of HLW were generated at these four sites, and the HLW has been, and continues to be, stored in HLW tanks at these sites. With respect to SRS, Defendants’ Mr. Allison, for example, notes:

As a result of its defense nuclear materials production mission, SRS generated large quantities of high-level waste (HLW). This waste resulted from dissolving spent reactor fuel and nuclear targets to recover the valuable isotopes, e.g., Pu-239 for defense purposes.

Allison Declaration ¶ 5.

⁴ There are other locations in the United States where reprocessing has taken place and HLW was generated, including a pilot reprocessing plant at Oak Ridge National Laboratory. Also, limited reprocessing probably has taken place in laboratory-scale facilities, so-called “hot-cells,” at other DOE facilities elsewhere.

HIGH-LEVEL WASTE QUANTITIES

15. The parties and the States agree that there are approximately 37 million gallons HLW in the 49 tanks at SRS that have not been closed⁵ (Allison Declaration ¶ 6); approximately 53 million gallons of HLW in 177 tanks at Hanford (Affidavit of Suzanne Dahl-Crumpler ¶ 11, submitted with the Joint Amicus Brief of Idaho, Oregon and South Carolina (“Dahl-Crumpler ¶ __”) (“States’ Brief”)); and at INEEL approximately 900,000 gallons of HLW in 15 tanks. (Trever Affidavit ¶ 15) (Bergholz ¶ 4).

16. In the 49 HLW tanks at SRS there are approximately 34 million gallons (92% of the volume) of supernate (liquid) and saltcake (solids) containing 200 million curies of radioactivity (45% of the curies, or radioactivity), and 3 million gallons of sludge (8% of the volume) containing 226 million curies of radioactivity (55% of the curies, or radioactivity) (Wilson Affidavit ¶ 8, 10); and the HLW tanks at INEEL contain approximately 500,000 curies of HLW. (Bergholz Declaration ¶ 26 (2)). At the end of 1995, the inventory of HLW in the 177 tanks at Hanford included 68.5 million curies of liquid HLW and 125.3 million curies of solid HLW.” (DOE IDB-1995 at 52).

FORMS OF HIGH-LEVEL WASTE

17. It is undisputed that the HLW in the tanks at SRS consists primarily of three physical forms: sludge, salt and liquid. (Allison Declaration ¶ 7). HLW in the tanks has also been characterized as “solids and supernate (aqueous salt solution, or liquids). The supernate includes free supernate (free-floating liquids) and interstitial supernate that is trapped in the solids (liquids mixed in with the solids).

⁵ One of these tanks, Tank 16, is said to be empty.

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18. Definitions of various components or categories of HLW, including “bulk waste,” “heel,” “high-heat waste,” “insoluble sludge,” low-heat waste,” saltcake,” “sludge,” “slurry,” and “supernate” can be found in Defendants’ own documents.⁶ The Dahl-Crumpler Affidavit also describes several of these terms at ¶¶ 13-18.

19. DOE notes in the SRS 1996 *HLW EA*, “The freshly generated HLW is further classified as either High-Heat Waste (HHW) or Low-Heat Waste LHW. HHW is generated during the first solvent extraction of the spent nuclear fuel. LHW is generated from the second and subsequent solvent extractions of the spent fuel and other support. The freshly generated HHW and LHW are segregated to improve processing of residual sludge and salt solutions within the Tank Farms and DWPF Vitrification Facility.” SRS 1996 *HLW EA*, Appendix A, *Waste Receipt and Aging*. The document also notes, “The HHW and LHW waste streams generated by the F- and H-Area Separations Facilities [reprocessing plants] contain insoluble and highly radioactive metal hydroxides (manganese, iron, and aluminum) which settle to the bottom of the waste tanks to form a sludge layer. The HHW and LHW are normally segregated. The combined sludge is managed as HHW sludge.” *Id.*, *Sludge Processing*.

20. Tank farm experience [at SRS] shows that the sludges typically contain high amounts of interstitial liquid (liquids mixed in with the solids) (70-85%).⁷

⁶ DOE, EA-1164; *Environmental Assessment for Closure of High-Level Waste Tanks in F- and H-Areas at the Savannah River Site*, July 1996,” Glossary (“SRS 1996 *HLW EA*”) (found on the web at (<http://www.globalsecurity.org/wmd/library/report/enviro/ea1164.htm>)).

⁷ P.D. d’Entremont and J.L. Thomas, “Characterization of Tank 19 Residual Waste,” Westinghouse Savannah River Company, WSRC-TR-2002-00052, Revision 0, March 15, 2002 (“d’Entremont & Thomas, Tank 19 Report”). Found on the web at <http://www.srs.gov/general/pubs/fulltext/tr2002052/tr2002052.html>).

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21. For the purpose of listing the amounts of HLW at DOE sites, DOE and Oak Ridge National Laboratory have characterized the physical form of HLW as being either “liquid” or “solid” where “[l]iquid tank waste consists of free tank supernate and drainable interstitial liquid.” and “Solid tank waste consists of sludge, salt cake, zeolite, calcine, and precipitate.” (Att. 1, DOE IDB-1995 at 52-53). This means the “liquid HLW” consists of liquids and the “solid HLW” consists of solids and the sludge that has liquid mixed in that cannot readily be drained.

22. At INEEL, the HLW streams from reprocessing are also referred to as “raffinates,” and some of the HLW is termed “sodium-bearing wastes.” Bergholz Declaration ¶¶ 6 and 7. Also, the HLW left in the bottom of the tanks after they are “emptied” is referred to as “heels.” Bergholz Declaration ¶ 14. According to Suzanne Dahl-Crumpler, “The hard concentrated sludge at the bottom of the tanks that may be extremely difficult to retrieve is called tank “heel.”” Dahl-Crumpler Affidavit ¶ 17.

THE PROPOSED ABANDONED WASTE IS HIGH-LEVEL WASTE

23. Based on the foregoing ¶¶ 13-21, the sludge, solid material, and liquid in the tanks at SRS have always been considered HLW, at least prior to a “Waste Incidental to Reprocessing” determination and subsequent pouring of grout into the HLW tanks during the proposed tank closure process. This is confirmed by DOE, which has stated, “Before bulk waste removal, the contents of the tanks is HLW.” SRS HLW Tank Closure *Record of Decision*, 67 FR 53783 (August 19, 2002). Since the “contents of the tanks” include the radioactive sludge, the sludge is characterized as HLW by DOE at least “before bulk waste removal.”

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24. The Declaration of Assistant Secretary Roberson confirms that the residual waste DOE proposes to leave in the tanks is predominantly the sludge. Assistant Secretary Roberson states, “My understanding is that Table C.3.1-1 of the SRS HLW Tank Closure Final EIS lists the total activity of the primary radioactive contributors that will remain in the tanks after bulk waste removal for final treatment and does not take credit for any additional cleaning.” Roberson Declaration ¶ 14. The estimated quantities of radionuclides in SRS F-Area and H-Area tanks (reported in Table C.3.1-1 cited by Assistant Secretary Roberson) were derived by multiplying volumes of residual waste assumed to remain in the tanks (given in Table C.3.1-2) by the concentrations of the various radionuclides in the sludge in the tanks. Att. 2, DOE, *Savannah River Site High-Level Waste Tank Closure Final Environmental Impact Statement*, DOE/EIS-0303, May 2002, C-18, Table C.3.1-1, n. (a) (“Att. 2, SRS 2002 *HLW Tank Closure Final EIS*”).⁸

25. In sum, the radioactive waste that DOE proposes to abandon in the HLW tanks at SRS was characterized by DOE as HLW when it went into the tanks; it is characterized as HLW in the computer spreadsheets used to derive Table C.3.1-1; it is part of the “content of the tanks” and therefore is characterized as HLW by DOE “before bulk waste removal;” and it is characterized as HLW in the physical form of “sludge,” at least up to the point that DOE makes a “Waste Incidental to Reprocessing” determination and subsequently pours grout into the HLW tanks during the proposed tank closure process.

⁸ Concentration data for 33 of the 51 HLW tanks are found in Table C.3.1-1 Worksheet Data, cited in Att. 2, Defendants’ SRS 2002 *HLW Tank Closure Final EIS* at C-18, Table C.3.1-1, Reference (a) (Newman and Hester), (dated 2/23/1999) (“Table C.3.1-1 Worksheet Data”). Plaintiffs are happy to submit the computer spreadsheet compilation in its entirety to the Court if the Court so wishes.

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26. The waste that DOE proposes to leave in the tanks is “highly radioactive material.” The States of Idaho, Washington, Oregon and South Carolina agree, noting that, “The tank wastes at the [Savannah River] site directly result from reprocessing of spent fuel and are *extremely radioactive*. (States’ Br. at 16; emphasis supplied) As an example, it is estimated that “the solids in [SRS] Tank 19 are currently 39 times the upper limit for Class C waste.” d’Entremont and Thomas, Tank 19 Report.

27. The residual waste that DOE proposes to abandon in the tanks is “material from reprocessing of spent fuel.” This is also the view of the States. States’ Br. at 16.

DOE IS NOT COMMITTED TO LEAVING ONLY A SMALL AMOUNT OF HLW IN THE TANKS

28. Assistant Secretary Roberson states:

The Plaintiff’s Statement of Material Facts at p. 7 and Dr. Cochran’s Declaration at paragraph 11 asserts that if DOE left one or two percent of the existing waste, such an amount represents 4 – 8 MCi of radioactivity, and equates this activity to a quantity of spent nuclear fuel assemblies. My understanding is that Table C.3.1-1 of the SRS HLW Tank Closure Final EIS lists the total activity of the primary radioactivity contributors that will remain in the tanks after bulk removal for final treatment and does not take credit for any additional cleaning. This data, along with recent characterization for closed Tanks 17 and 20, shows that the projected quantity of radioactivity in the tank residues is approximately 176,000 curies and is approximately 20-times less than the lower end (4 MCi) asserted by Plaintiff’s Statement of Material Facts. After approximately 300 years, well within the expected analyzed life of 1000 years for the grout in the stabilized tank (SRS Final EIS), this radioactivity will have decayed away to approximately 0.1% of the original amount.

Roberson Declaration ¶ 14.

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There is a glaring omission in this statement and several errors in the underlying data relied upon by Assistant Secretary Roberson for this statement and in the statement itself.

29. The glaring omission is that the EIS states:

Table C.3.1-2 lists the volume and residual material assumed for modeling purposes to remain in closed HLW tanks and *do not represent a commitment or goal for waste removal.*

Att. 2, SRS 2002 *HLW Tank Closure Final EIS* at C-17 (emphasis supplied). The Final EIS makes clear that DOE is not committed to removing the amount waste reflected in the table cited by Assistant Secretary Roberson.⁹

30. Contemporaneous with the preparation of the SRS Tank Closure Final EIS, May 2002, the DOE contractor at SRS prepared a report documenting “the basis for the residual waste inventories that will be used in the Tank 19 fate and transport modeling.” d’Entremont and Thomas, Tank 19 Report. According to this report, in 1980-1981, a salt removal program reduced the solids in the tank from over one million gallons to an estimated 33,000 gallons. From September 2000 to June 2001, heel removal was performed on the estimated 33,000 gallons, and in August 2001 the tank walls were washed. At the end of this process it was determined that Tank 19 contained an estimated 15,000 gallons of wet sludge in the bottom of the tank and 1,800 gallons of free supernate. *Id.* The “NRC Class C Calculation” in the report was based on the assumption that the residual tank inventory would include the 15,000 gallons of wet sludge. This

⁹ Also in the Final EIS, DOE states, “Based on experience in removing waste from Tanks 16, 17, and 20, DOE has assumed that the volume of material remaining after only bulk waste removal would be 10,000 gallons per tank. *Id.* C-17. There are approximately 37 million gallons of HLW liquids and solids in the 49 HLW tanks that have not been closed. *See* Allison Declaration ¶ 6. Therefore, bulk waste removal of the remaining 49 tanks would leave 490,000 gallons or 1.3 percent of the present inventory. This conclusion confirms the (at least) one to two percent of HLW abandonment assumed in my initial declaration.

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volume of residual waste *is 15 times greater than the 1,000 gallons assumed for Tank 19 in the SRS Tank Closure Final EIS. See Att. 2, SRS 2002 HLW Tank Closure Final EIS at C-18, Table C.3.1-2.*

31. While both the SRS 2002 *HLW Tank Closure Final EIS* (Att. 2) and the contractor report (d'Entremont and Thomas, Tank 19 Report) contain disclaimers, there is no commitment by DOE to further reduce the Tank 19 residual waste from 15,000 to 1,000 gallons. Assistant Secretary Roberson claims, "My understanding is that Table C.3.1-1 of the SRS HLW Tank Closure Final EIS lists the total activity of the primary radioactivity contributors *that will remain in the tanks after bulk waste removal* for final treatment and does not take credit for any additional cleaning." Roberson Declaration ¶ 14 (emphasis added). Tables C.3.1-1 and C.3.1-2 of the SRS 2002 *HLW Tank Closure Final EIS* to which Assistant Secretary Roberson refers are for modeling purposes only and inaccurate for Defendants' purposes here.

ASSISTANT SECRETARY ROBERSON UNDERSTATES THE RADIOACTIVITY LEFT IN THE TANKS

32. There are other errors in Roberson Declaration ¶ 14 that merit correction. First, Table C.3.1-1 does not list all the "primary radioactivity contributors that will remain in the tanks after bulk waste removal . . ." Table C.3.1-1 excludes yttrium-90m (Y-90m), a radioactive daughter product resulting from the decay of strontium-90 (Sr-90), and barium-137m (Ba-137m), a radioactive daughter due to the decay of cesium-137 (Cs-137). The curie amount of Y-90m is equal to that of Sr-90, and the curie amount of Ba-137 equals about 95 percent of the curie amount of Cs-137. Since Sr-90 and Cs-137 represent about 98 percent of the radioactivity listed in Table C.3.1-1, including these two

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radioisotopes, Y-90m and Ba-137m, would increase the total curies of radioactivity by about 97 percent—almost doubling the 176,000 curies reported by Assistant Secretary Roberson (and the total curies in Table C.3.1-1).¹⁰

THE CONCENTRATION OF RADIOACTIVITY IN THE ABANDONED HLW CAN BE AS GREAT, OR GREATER, THAN THAT OF THE HLW REMOVED

33. “Concentration” is defined as, “The amount of a substance in weight, moles, or equivalents contained in unit volume.” *CRC, Handbook of Chemistry and Physics*, 68th Edition, at F-75. “Volume, unit of” is defined as “The cubic centimeter, the volume of a cube whose edges are one centimeter in length. Other units of volume are derived in a similar manner. Dimension. [L³].” *Id.*, at F-108.

34. Plaintiffs asserted that “the concentration of radioactivity in the abandoned sludges and sediments can be as high, or even higher, than the concentration of radioactivity in the materials removed from the tanks . . .” Plaintiff’s Statement of Material Facts at 4. Assistant Secretary Roberson erroneously claims that this is not correct. Roberson Declaration ¶ 9. Assistant Secretary Roberson is in error; she uses mathematical averaging to give the appearance that radioactivity concentrations are smaller than they are in reality. This can be seen from the concentrations of radioactivity in sludge, salts and supernate (liquid) in 33 HLW tanks at SRS.¹¹ In a majority of the HLW tanks at SRS where data is available—in more than a dozen HLW tanks—the

¹⁰ The 176,000 curies reported by Assistant Secretary Roberson is greater than 171,000, the sum of the curies of the isotopes given in Table C.3.1-1. If the Assistant Secretary is including other isotopes, not identified in Table C.3.1-1, she should so indicate. Including all isotopes that are in the referenced wctables and using values for 2/23/99, would increase the total radioactivity in all 48 non-emptied tanks (i.e., excluding Tanks 16, 17, and 18) to 561,000 curies.

¹¹ Table C.3.1-1 Worksheet Data and ¶ 37 below.

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concentration of radioactivity in sludge *exceeds* the concentration of radioactivity in salt and in supernate (liquid).¹² Since the residual radioactivity DOE proposes to abandon in tanks is predominately sludge, and the waste DOE proposes to remove from the tanks is predominately supernate (liquid) and salts, the concentration of radioactivity in the abandoned sludges and sediments can be as high, or even higher, than the concentration of radioactivity in the materials removed from the tanks.

35. The States note this fact as well: “[t]here are 3 million gallons of this sludge (8% of the volume) containing 226 million curies of radioactivity (55% of the curies).” Wilson Affidavit ¶ 8 referring to SRS; *see also Id.* ¶¶ 6-11 (“There are approximately 34 million gallons (92% of the volume) of supernate and salt cake containing 200 million curies of radioactivity (45% of the curies).” *Id.* ¶ 11. On average, the concentration of radioactivity in sludge is greater than that in liquids and solids. Thus, for most of the tank waste at SRS, the concentration of radioactivity in what DOE proposes to abandon is greater than the concentration of radioactivity in what DOE proposes to remove from the tanks.

ASSISTANT SECRETARY ROBERSON SELECTIVELY CHOOSES DATA

36. There are two additional problems with Assistant Secretary Roberson’s claim reproduced at ¶ 28 above. First, the Assistant Secretary chooses as evidence the results from cleaning out Tanks 17 and 20, which prior to closure were among the cleanest tanks at SRS.

¹² In 1996 DOE stated, “At the present time the approximately 129 million liters (34 million gallons) of High-Level Waste (HLW) are being treated to separate the high-activity fraction (a sludge) from the low activity fraction (a liquid).” SRS 1996 *HLW EA*, Section 1.1.1.

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37. In support of her claim, Assistant Secretary Roberson begins by noting that the average concentration of radioactivity in operating HLW tanks is 3,245 Ci/m³. Roberson ¶ 9. This is equal to 12.3 curies per gallon (“Ci/gal”).¹³ Assistant Secretary Roberson also cites the concentration of radioactivity in HLW canisters (final disposal form)—5,575 Ci/m³ (21.1 Ci/gal). *Id.* These average concentration figures are undisputed. The radioactivity concentration in the SRS HLW tanks and in the sludge in these tanks, however, varies widely. I have summarized the Table C.3.1-1 Worksheet Data here:

Table 1. Radioactivity Concentrations in SRS HLW tanks (values for 2/23/99).¹⁴

Tank	Surrogate Tank	Area	Residual Waste (DOE) (gal)	Radioactivity Concentration in Sludge (Ci/gal)	Radioactivity Concentration in Salt (Ci/gal)	Radioactivity Concentration in Supernate (Ci/gal)
1		F	100	201.80	1.75	38.58
2		F	100	44.31	2.75	14.31
3		F	100	40.19	3.75	14.31
4		F	100	73.92	4.75	20.62
5		F	100	236.32		
6		F	100	308.54		2.45
7		F	100	40.82		6.21
8		F	100	59.88		1.43
9		H	100	47.76	9.75	14.03
10		H	100	5.10	10.75	2.45

¹³ Since there are 264.1721 gallons (U.S.) in a cubic meter.

¹⁴ In Table 1, concentration data are given for 33 of the 51 HLW tanks (values for 2/23/1999). The Table C.3.1-1 Worksheet Data do not include data for Tanks 16, 17, and 20 because these tanks are either empty (Tank 16) or closed (Tanks 17 and 20). It should be noted that inventory data for 15 tanks were not available in the DOE/SRS database. In preparation of the SRS 2002 *HLW Tank Closure Final EIS*, DOE (and its contractor) used surrogate tank data where tank data were unavailable or where tank inventories were expected to change. SRS apparently does not know the concentrations of radioisotopes in the sludge in several tanks, so values for other tanks were used as “surrogates.” The volume of sludge that DOE assumes will be left in the tanks is in dispute.

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11		H	100	91.71		2.42
12		H	100	171.95		
13		H	100	80.40		26.45
14		H	100	16.95	14.75	32.51
15		H	100	81.68		
16	emptied	H	100			
17	closed	F	2200			
18		F	1000	0.50		3.58E-04
19		F	1000	0.22	19.75	5.12E-02
20	closed	F	1000			
21		H	100	9.10		3.50E-02
22		H	100	12.76		2.98E-03
23		H	1000	0.02		3.58E-04
24	43	H	100			0.08
25	26	F	1000		25.75	8.36
26		F	1000	2.17		11.57
27	26	F	1000		27.75	4.82
28	26	F	1000		28.75	10.26
29	13	H	100		29.75	19.33
30	13	H	100	224.20	30.75	26.20
31	13	H	100		31.75	24.87
32		H	100	136.82		13.19
33		F	100	398.81	33.75	0.29
34		F	100	901.04	34.75	6.88
35		H	100	359.19		18.14
36	13	H	100	165.30	36.75	40.69
37	13	H	100		37.75	29.92
38	43	H	100		38.75	1.48
39		H	100	260.10		4.81
40		H	100	2.96		2.08
41	43	H	100			4.95
42	13	H	100	10.26		3.58E-04
43		H	100	43.28		1.32
44	26	F	1000			10.33
45	26	F	1000			13.17
46	26	F	1000			15.97
47		F	1000	1.57		5.20
48	13	H	100			3.58E-04
49	13	H	100			3.58E-04
50	13	H	1000			3.58E-04
51	13	H	100	5.50		0.12
TOTAL		51	18,900			
F		22	14,200			
H		29	4,700			

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38. As seen from Table 1 at ¶ 37, the concentrations of radioactivity in sludge vary by more than a factor of 4,000, and are as low as 0.22 Ci/gal (Tank 19) and as high as 901 Ci/gal (Tank 34).¹⁵ One cannot credibly or logically refute Plaintiff's claim that the residual concentrations "can be as high, or higher" than materials removed from the tanks by choosing as one's evidence two of the cleanest tanks and without at least some reference to the concentration of the waste removed from the tank. Moreover, as seen from Table C.3.1-1 Worksheet Data, the concentrations of radioactivity in sludge in many tanks is higher than 12.3 Ci/gal, the average concentration of radioactivity in the tanks, and higher than 21.1 Ci/gal, the average concentration of radioactivity in the HLW canisters (final disposal form).

THE HLW WOULD NOT BE THOROUGHLY MIXED WITH GROUT

39. The second problem with Assistant Secretary Roberson's claim reproduced at ¶ 28 above, is that she takes credit for mixing of radioactivity with grout, which physically does not occur in to any appreciable degree. Assistant Secretary Roberson claims that the average concentration of radioactivity in Tanks 17 and 20 after closure are 1.1 Ci/m³ [= 0.0042 Ci/gal] and 0.9 Ci/m³ [= 0.0034 Ci/gal], respectively, where these are the concentrations of radioactivity averaged over the sludge remaining in the tank and the "grout credited for binding up the wastes." Roberson ¶ 9. This mathematical averaging does not actually change the concentration of the abandoned HLW to any appreciable degree. This can be seen by examining the closure of Tank 17. The projected Tank 17 residual inventory of radionuclides after waste removal and spray

¹⁵ Sr-90 is the most abundant isotope in sludge. The concentration of Sr-90 in Tank 34 sludge was estimated to be 355 Ci/gal, more than 4,000 times greater than the 0.0751 Ci/gal in Tank 19.

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washing are found in DOE's document, "Industrial Wastewater Closure Module for the High-Level Waste Tank 17 System," Revision 1, Savannah River Site, April 2, 1997, p. A-18, Table A-4 (originally included in Plaintiffs' Complaint, Att. 17).

40. Adding the residual values in Table A-4 of the Tank 17 data, the total amount of radioactivity in sludge (before the addition of grout) was approximately 129 curies. This radioactivity was in approximately 2,200 gallons of sludge (Att. 2, Table C.3.1-1 Worksheet Data), so the estimated concentration of radioactivity in the residual sludge was approximately 0.059 Ci/gal (15.5 Ci/m³).¹⁶ Since interstitial liquid (liquid mixed in with solids) typically accounts for 70-85% of the volume of sludge, once the sludge dries following tank closure, the residual solids, or heels, represent only about 15-30% of the original sludge volume. Therefore, the estimated concentration of the dry heel at the bottom of Tank 17 is about 0.2-0.4 Ci/gal (about 50 to 100 Ci/m³).

41. To give the impression that the concentration of residual radioactivity has been diluted from 15.5 Ci/m³ to 1.1 Ci/m³, Assistant Secretary Roberson "takes credit" for approximately 28,780 gallons of grout ($129 \text{ Ci} / 1.1 \text{ Ci/m}^3 = 117 \text{ m}^3 = 30,980 \text{ gallons} - 2,200 \text{ gallons sludge} = 28,780 \text{ gal}$), out of the approximately, 1,300,000 gallons of grout that were added to Tank 17. Att. 2, Table C.3.1-1 Worksheet Data. Thus, the approximately 28,780 gallons of grout that Assistant Secretary Roberson "credits" as binding with the waste is 13 times the 2,200 gallons of sludge left in the bottom of the

¹⁶ Here, it noted that the estimated concentration of radioactivity in the Tank 17 sludge was less than the estimated concentration of radioactivity in sludge in nearly all, if not all, other HLW tanks at SRS where data is available. Tank 23 is the only tank in the Table C.3.1-1 Worksheet Data, where the concentration is less than that of Tank 17. It is unclear whether Tank 23 has a lower concentration, or this single case reflect a lack of inventory data for specific radionuclides in Tank 23. This simply confirms that Defendants have chosen the cleanest tank to suggest that the concentration of radioactivity to be left in the tanks is small.

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tank. Since the “fill factor” for Tank 17 is approximately 3,540 gallons per inch, the 2,200 gallons of sludge has a height of about 0.6 inches and Assistant Secretary Roberson is “taking credit” for 8 inches of grout. It is obvious the approximately 28,780 gallons (8 inches) of grout is not thoroughly mixed with the 2,200 gallons (0.6 inches) of sludge. Rather, it is poured on top of the sludge.

42. For Tank 19, it has been proposed to “take credit” for 20 .2 inches of grout poured over 15,000 gallons (4.2 inches) of sludge. d’Entremont and J.L. Thomas, Tank 19 Report. Here again, it is not credible to assume that the sludge is actually diluted by the grout. DOE does not even make this claim.

43. One would expect some binding at the interface of the sludge and the grout poured on top of it. Assistant Secretary Roberson claims, “The initial grout addition added to the tanks, both stabilizes the waste and is formulated to promote some chemical binding of the waste constituents.” Roberson Declaration ¶ 12. “Promoting binding” is not synonymous with “uniformly mixing.” Substantial mixing is not even contemplated. DOE is proposing to take credit for mixing whether significant mixing takes place or not, by an amount of “grout credit” that would be sufficient to reduce the “average concentration” to below Class C levels. Note that DOE’s Mr. Allison claims only that the residual waste would “be *in average* concentrations suitable for near surface disposal.” Allison Declaration ¶ 29(emphasis added). Mr. Allison includes the words “in average” to avoid the false statement that the actual concentrations of the abandoned waste would be as low.

44. “Average concentration,” as DOE uses the term, is not the same as and should not be confused with “actual concentration.” Mathematical “averaging,” as

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performed by DOE, does not imply dilution through mixing, and therefore does not imply a reduction in the concentration.

45. Assistant Secretary Roberson states:

The residual wastes in the tanks will be or have been stabilized in solid form, and depending upon waste incidental to reprocessing determinations pursuant to DOE O 435.1 and DOE Manual 435.1-1, and managed as low level waste as part of the tank closure programs. Through this process, the stabilized tank residual wastes, *on average*, meet the standards for Class C low-level waste, as specified in 10 CFR 61.55, and low-level waste performance objectives comparable to 10 CFR 61 C.

Roberson Declaration ¶ 9 (emphasis added).

Setting aside the legal opinion offered by Assistant Secretary Roberson, under the DOE proposal the residual sludge at the bottom of the tank will contain radioisotopes in concentrations that exceed the Class C limits. The fact that DOE is engaging in a mathematical averaging of radioactivity in the sludge over the volume (or mass) of the grout, with no significant mixing of the radioactivity with the grout, can be seen in DOE's own report. d'Entremont and J.L. Thomas, Tank 19 Report. The Class C calculation methodology is found in the section titled, "NRC Class C Calculation" and the calculations are shown in Table 6 of this DOE report. There is no discussion of mixing and nothing in the methodology requires it.

46. The mathematical averaging, "taking grout credit," process renders meaningless the objective of establishing concentration limits for Class C and other waste categories in 10 CFR 61.55. DOE could just as well average the residual radioactivity in the tanks with arbitrary volumes (or mass) of earth under the tanks or the groundwater adjacent to the tanks. I cannot make myself younger by averaging my age with the ages

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of my daughters. Neither can DOE reduce the actual concentration of residual waste by averaging the radioactivity over arbitrary volumes (or masses) of materials with which the wastes are not thoroughly mixed.

MINOR CORRECTIONS AND SECONDARY ISSUES

47. Assistant Secretary Roberson states, “Spent nuclear fuel reprocessing was conducted by the Department to separate fissile elements (U-235, Pu-239, U-233, and Pu-241) and/or transuranium elements (*e.g.*, Np, Pu, Am, Cm, Bk) from other materials (*e.g.*, fission products, activated metals, cladding) contained in spent nuclear fuel; for the purposes of recovering desired materials, . . .” Roberson Declaration ¶ 4. This statement is improperly worded in that it confuses “elements” and “isotopes.” U-235, U-235, Pu-239, etc. are isotopes of elements, not elements. Also, the recovered uranium and plutonium contain non-fissile isotopes of these elements, *e.g.*, U-238 and Pu-240.¹⁷

48. Assistant Secretary Roberson states, “During reprocessing operations, the desired materials (uranium and plutonium) were removed via a chemical process and the waste streams, which contained the bulk of the fission products, were routed to tanks for storage and subsequent treatment.” Roberson Declaration ¶ 5. This is true for the principal DOE reprocessing operations, which relied on aqueous reprocessing (*e.g.*, PUREX). There is at least one non-chemical reprocessing technique that has been developed and utilized by DOE, albeit on an R&D scale, namely pyroprocessing.

Pyroprocessing is a reprocessing technique that utilizes an electrorefining technique,

¹⁷ The Implementation Guide for use with DOE M 435.1-1 (II-5), AR 22234 (quoted in Defendants Brief at p.8. footnote 12) is similarly improperly worded where it states, “However, reprocessing is considered by the Department to be those actions necessary to separate fissile elements (U-235, Pu-239, U-233, and Pu-241) and/or transuranium elements (*e.g.*, Np, Pu, Am, Cm, Bk) from other materials (*e.g.*, fission products, activated metals, cladding) contained in spent nuclear fuel; for the purposes of recovering desired materials.”

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rather than chemical processes, for separating product and waste streams. This reprocessing concept was developed by DOE's Argonne National Laboratory and a pilot-scale pyroprocessing plant has been in operation at INEEL. I do not know how DOE has managed the HLW from this plant.

49. In Roberson Declaration ¶ 8, Assistant Secretary Roberson confirms that DOE proposes to dispose of HLW in the bottom of the tanks, and the bottoms of the tanks at SRS are 31 feet to 38 feet below the surface. The HLW emplacement area where DOE proposes to bury HLW at the proposed Yucca Mountain repository will be 200 to 425 meters (660 to 1,400 feet) below the surface. More importantly, the residual waste that DOE proposes to leave in the SRS tank bottoms will be in or very near the water table, whereas the Yucca Mountain HLW emplacement area is 175 to 365 meters (574 to 1,200 feet) above the water table. Thus, DOE intends to dispose of the HLW in shallow-land burial, as opposed to deep geological burial.

50. Contrary to Assistant Secretary Roberson's claim (at ¶ 14), and contrary to the table caption (Att. 2, SRS 2002 *HLW Tank Closure Final EIS*, p. C-18), Table C.3.1-1 does not report the "total activity of the primary radioactivity contributors that will remain in the tanks after bulk removal for final treatment." Rather these concentrations are estimated concentrations after subsequent waste removal steps, such as spray water washing and oxalic acid wash and rinse. This can be seen by comparing the data in Table 2-1 (Att. 2, SRS 2002 *HLW Tank Closure Final EIS*, p. 2-3), with the data in Tables C.3.1-1 and C.3.1-2. From Table 2-1, it is seen that starting with 2.83 million curies in Tank 16, it is estimated that "Bulk Waste Removal" removed 97% of the radioactivity, leaving 84,900 curies; "Bulk Waste Removal" followed by "Spray Water Removal" was

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estimated to remove 97.98% of the radioactivity, leaving 2.02% or 57,200 curies. “The amount of waste left after spray washing was estimated at about 18,927 liters (3,500 gallons) in Tank 16.” Att. 2, SRS 2002 *HLW Tank Closure Final EIS*, Section 2.1.1. This is 35 times the volume of waste listed in Table C.3.1-2.

ERRORS IN THE FIRST DECLARATION OF THOMAS B. COCHRAN

51. Assistant Secretary Roberson is correct in noting an error in Plaintiff’s Statement of Material Facts at p. 7 and in the First Declaration of Thomas B. Cochran at paragraph 15. Using 22,000 gallons as the reference standpoint, leaving 1,000 gallons in the tank is about 4.5% of the initial 22,000 gallons. It is undisputed that Tank 20 may have held almost 1 million gallons of high-level waste sometime during the past 40 years.

52. Assistant Secretary Roberson is correct in noting a typographical error in Plaintiff’s Statement of Material Facts, at p. 7; *see also*, Bergholz Declaration ¶ 26 (2). The estimate of the amount of radioactivity in high-level radioactive waste tanks at INEEL is 0.5 MCi, not 5 MCi. A more complete description of the HLW management activities, including inventories of HLW, at INEEL can be found in the Trever Affidavit ¶¶ 3-16 and Bergholz Declaration ¶¶ 4-15.

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Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury, that the foregoing is true and correct to the best of my knowledge and belief.

Signed on the ____ day of April, 2003,

Thomas B. Cochran, Ph.D.
Director, Nuclear Program and
Wade Green Chair for Nuclear Policy
Natural Resources Defense Council, Inc.

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See signature page for complete list of parties represented.

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF IDAHO

<hr/>)	
Natural Resources Defense Council, Inc.;)	
Confederated Tribes & Bands of the Yakama)	
Nation; Snake River Alliance)	
)	
	Plaintiffs)	
)	Case No. 01-CV-413 (BLW)
	v.)	
)	
Spencer Abraham, Secretary, Department)	
of Energy; United States of America,)	
)	
	Defendants)	
<hr/>)	

COMPLAINT FOR DECLARATORY AND INJUNCTIVE RELIEF

Nature of the Action

1. This action seeks to compel defendants, United States Department of Energy ("DOE") and its Secretary, Spencer Abraham, to comply with the Nuclear Waste Policy Act, 42 U.S.C. §§ 10101 et seq. ("NWPA") and the Administrative Procedures Act ("APA"), 5 U.S.C. § 701 et seq. Defendants violated the NWPA by promulgating DOE Order 435.1, which has in it a specific provision that allows DOE to reclassify high-level radioactive waste and call it "incidental waste." This renaming process would allow DOE to permanently leave high-level radioactive waste—which will gradually disperse into the environment—in shallow burial in more than 200 nuclear waste storage tanks located at three DOE nuclear weapons sites: the Hanford Reservation in Washington near the Columbia River, the Idaho National Engineering and Environmental Laboratory ("INEEL") above the Snake River Aquifer, and the Savannah River Site ("SRS") in South Carolina where several tanks literally sit in the water table.

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2. The DOE and its predecessors, the Atomic Energy Commission ("AEC") and the Energy Research and Development Agency ("ERDA"), in the course of the production of nuclear weapons, generated approximately 100 million gallons of high-level radioactive waste. The DOE, ERDA and the AEC managed this high-level radioactive waste, one of the most dangerous substances known to humankind, by placing the waste in huge, underground storage tanks at INEEL, Hanford and Savannah River.¹ Over the last few decades, hundreds of thousands of gallons of this waste have leaked into the environment and continues to do so.

3. The management of these tanks and their high-level radioactive waste has been an expensive and technically complex problem for DOE. Various plans for tank waste management have been forwarded, including transferring pumpable liquids from single shelled tanks to double shelled tanks (at Hanford), heating the waste to convert it to a powdery form (called calcining and was done at INEEL), and vitrifying the waste (a process that stabilizes radioactive waste by mixing it with molten glass) for disposal at a geologic repository pursuant to the NWPA.

4. DOE manages high-level waste according to applicable federal law, such as the NWPA, the Atomic Energy Act ("AEA"), 42. U.S.C. § 2201, 10 C.F.R. Part 60, and DOE Order 435.1, which governs the Department's management of radioactive waste. As DOE itself notes, "[T]he intense radioactivity primarily determines how high-level waste is managed ... [U]nder federal law, DOE high-level waste will eventually be disposed of in geologic repositories after it has been treated to produce solid waste forms acceptable for disposal, and repository facilities become available." U.S. DOE Report Linking Legacies, at 32-33, and 38. DOE/EM-0319 (January 1997).

¹ In addition, there are similar wastes in storage tanks at West Valley, New York.

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5. Under its recently promulgated radioactive waste management authority, Order 435.1, DOE has awarded itself the authority to reclassify the high-level waste that remains in the tanks after some part of the liquid waste has been pumped out as "incidental waste" or "waste incidental to reprocessing."² Instead of following federal law and disposing of high-level radioactive waste in a geologic repository, DOE intends to leave literally thousands of gallons of the highly radioactive sediments and sludges in the bottom of the underground tanks, cover the waste in place with concrete, and hope for the best. The waste remaining in the tanks will also have comparable—and potentially much higher—concentrations of radioactive elements than the high-level waste removed from the tanks for disposal in a geologic repository. DOE has already implemented this process with three tanks at Savannah River and has grouted them in place for "permanent disposal."

6. Fundamentally, DOE's action creates three national sacrifice zones for high-level waste. Via Order 435.1, DOE arbitrarily and unilaterally reclassifies high-level waste as "incidental waste," thereby exempting it from the NWPAA and allows this dangerous waste to be subject to an entirely different, and substantially less stringent set of disposal criteria. Disposal of tens of thousands of gallons of high-level waste in the INEEL, Hanford, and Savannah River waste tanks will (1) result in a potentially catastrophic dispersal of radioactivity into the environment and (2) at a minimum, will require significant land-use restrictions, maintenance, and monitoring in perpetuity. Such an action is fundamentally inconsistent with the plain language of the NWPAA and its overriding purpose of ensuring that high-level radioactive waste does not "adversely affect the public health and safety and the environment for this or future generations." 42 U.S.C. §10131(a)(7).

² "Waste incidental to reprocessing" and "incidental waste" are interchangeable terms.

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7. With this lawsuit, which is brought under the NWPA and the APA, plaintiffs Natural Resources Defense Council, Inc. ("NRDC"), the Snake River Alliance, and the Confederated Tribes and Bands of the Yakama Nation ("Yakama Nation") seek a court order setting aside as arbitrary, capricious and contrary to law the provisions of Order 435.1 that relate to incidental waste. Further, plaintiffs seek a court order enjoining defendants from (1) taking any action with respect to waste in the tanks that would be inconsistent with the requirements for high-level waste radioactive disposal under the NWPA; and (2) taking any actions that include but are not limited to, grouting with concrete for "permanent disposal" any additional high-level waste tanks.

Jurisdiction and Venue

8. Jurisdiction over this action is based on 28 U.S.C. § 1331 (federal question jurisdiction) and 5 U.S.C. § 701 et seq. ("APA"). The relief sought is authorized by 28 U.S.C. § 2201 (Declaratory Judgment) and 28 U.S.C. § 2202 (Injunctive Relief).

9. Venue is properly in this Court under 28 U.S.C. § 1391(e), because this is an action against a United States agency which has a facility and conducts actions on matters that are the subject of this Complaint within the State of Idaho.

10. There is an actual, present and justiciable controversy between the parties to this action. As plaintiffs have exhausted their administrative remedies and have no adequate remedy at law, plaintiffs are entitled to have a declaration of their rights and of defendants' obligations, and further relief, because of the facts and circumstances hereinafter set out.

Parties

11. Plaintiff Natural Resources Defense Council, Inc. ("NRDC") is a national non-profit membership environmental organization incorporated under the laws of New York, with offices

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in Washington, D.C., New York City, San Francisco and Los Angeles. NRDC's nationwide membership of over 390,000 individuals includes over 20,000 members in Idaho, Washington, and South Carolina where DOE has nuclear weapons facilities and storage tanks of high-level radioactive waste. NRDC has a long history of advocacy, including prior litigation, on issues related to DOE's nuclear waste disposal and environmental remediation programs. For more than 25 years, NRDC has played a major role in setting vital legal precedents in the application of environmental laws to U.S. nuclear weapons programs.³

12. NRDC's objectives include maintaining and enhancing environmental quality and monitoring federal agency actions to ensure that federal statutes enacted to protect human health and the environment are fully and properly implemented. Since its inception in 1970, NRDC has sought to improve the environmental and safety conditions at nuclear weapons facilities owned and operated by agencies of the United States Government. To achieve this objective, NRDC and its members engage in legislative activities, litigation, administrative actions, and public education efforts to inform others about the environmental impacts of Defendants' activities.

13. The Confederated Tribes and Bands of the Yakama Nation is a federally recognized Indian tribe under the Treaty of June 9, 1855 (12 Stat. 951) with the United States. The Yakama people have resided in the Columbia River Basin in the Pacific Northwest since time immemorial. The Yakama Reservation, established by Article II of the Treaty, is twenty-five miles directly west of the Hanford Nuclear Reservation in south-central Washington and has approximately 1.3 millions acres of land within its boundaries. In 1855 the tribe ceded millions of acres of its aboriginal lands to the federal government, comprising approximately one quarter of the State of Washington and including what is now the Hanford Site.

³ See, e.g., Legal Envtl. Assistance Found. v. Hodel, 586 F.Supp. 1163 (E.D. Tenn. 1984) (finding that DOE is subject to federal environmental laws); NRDC v. NRC, 606 F.2d 1261 (D.C. Cir. 1979).

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14. Under Article III of the Treaty, the Yakama people reserved rights to fish at all usual and accustomed places within the Columbia River Basin. See U.S. v. Winans, 198 U.S. 371 (1905); Seufert Bros. Co. v. U.S., 249 U.S. 194 (1919); Tulee v. State of Washington, 315 U.S. 681 (1942); Sohappy v. Smith, 302 F.Supp. 899 (D.Or. 1969) (also known as U.S. v. Oregon). Fishing sites range throughout the Columbia and its sub-basins, including the Yakima River only a few miles from Hanford. The government of the Yakama Nation has regulatory authority over the off-reservation fishing rights of its members, and sets annual seasons for both subsistence and commercial fishing in the Columbia Basin. See Settler v. Lameer, 507 F.2d 231 (9th Cir. 1974).

15. Fishing has been a central part of Yakama culture since time immemorial, and the annual salmon runs of the Columbia River continue to hold a deep religious significance to tribal members. Although spring chinook salmon is the most prized species, tribal fishermen also catch fall chinook, coho, sockeye, steelhead, sturgeon and lamprey. Spawning areas for fall chinook salmon include the stretch of the Columbia that flows through the Hanford Site (the “Hanford Reach”).

16. The Snake River Alliance is an Idaho-based non-profit membership environmental organization incorporated under the laws of Idaho, with offices in Boise, Ketchum and Pocatello. The Snake River Alliance was founded in 1979 by people who had just learned that INEEL routinely injected hazardous and radioactive waste into the Snake River Aquifer via an injection well at the Idaho Nuclear Technology and Engineering Center (“INTEC”). After a multi-year public education effort by the Snake River Alliance, the INTEC injection well was taken out of routine service in 1984 and capped by the Governor of Idaho in 1989. The Snake River Alliance has over 1,000 dues-paying members, most of whom live in southern Idaho. Many Alliance

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members rely on the Snake River Aquifer as a sole-source aquifer for drinking and irrigation. Also, many members recreate on the Snake River, downstream from the aquifer's outlet near Thousand Springs. One of the Snake River Alliance's central missions is to work for responsible solutions to nuclear waste disposal and effective environmental remediation of the numerous highly contaminated sites at INEEL. The Snake River Alliance is identified as a "key stakeholder" in the Idaho High-Level Waste and Facilities Disposition Draft Environmental Impact Statement, which was published by the Department of Energy in December 1999.

17. Defendant United States Department of Energy is an executive department and "agency" of the United States Government, within the definition of Section 701 of the Administrative Procedures Act, 5 U.S.C. § 701 et seq., subject to the laws, regulations, and executive orders of the United States. The Department is charged with responsibilities in connection with the management, storage, and ultimate disposal of high-level radioactive waste resulting from the production of nuclear weapons and other activities. One of DOE's largest nuclear weapons facilities is the Idaho National Engineering and Environmental Laboratory, located in Idaho Falls, Idaho 83415. The Atomic Energy Commission (a predecessor to DOE) established the Idaho facility in 1949. Once the site of the world's largest concentration of nuclear reactors, INEEL was designated a Superfund site in 1989 and is the continuing recipient of millions of cubic feet of nuclear waste from throughout the nuclear weapons complex. INEEL covers an 892 square mile reservation approximately 32 miles west of the city of Idaho Falls, Idaho.

18. Defendant Spencer Abraham is the Secretary of Energy and is sued in his official capacity. Secretary Abraham has direct responsibilities for the management and disposal of DOE's high-level radioactive waste.

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Background and Factual Allegations

19. After almost 9 years of development and pursuant to APA notice and comment procedures, DOE issued notice of its final Order 435.1 in the Federal Register on July 14, 1999. 64 Fed. Reg. 29393. See also, *Notice of Availability, Draft DOE Order 435.1*, 63 Fed. Reg. 42,012, 42,013 (August 6, 1998).⁴

20. DOE Order 435.1 states that “[a]ll radioactive waste shall be managed in accordance with the requirements in DOE M 435.1-1, *Radioactive Waste Management Manual*.” Att. 1 at 3. Indeed, except for a few minor exclusions, all "DOE elements" are required to comply with DOE Order 435.1 and compliance by DOE contractors is imposed through provisions built into their contracts with DOE. Id. at 1-2.

21. DOE Order 435.1 and its accompanying manual ("Att. 2, 435.1-1 Manual") and guidance ("Att. 3, 435.1-1 Guidance") delineate radioactive waste standards, management protocols, and testing requirements for every kind of radioactive waste DOE manages within the nuclear weapons complex. The 435.1-1 Manual, which sets out the incidental waste exemption process, prescribes numerous requirements and policies that

apply to all new and existing DOE radioactive waste management facilities, operations, and activities. Implementation of the requirements shall begin at the earliest possible date, and all DOE entities shall be in compliance with this directive within one year of its issuance Failure to implement the requirements of this directive shall, through the appropriate lines of management, result in corrective actions including, if necessary, shutdown of radioactive waste management facilities, operations, or activities until the appropriate requirements are implemented.

Att. 2, DOE M 435.1-1 at i. Thus, according to its own express terms, DOE Order 435.1 establishes mandatory legal requirements for the management and disposal of radioactive wastes at all DOE facilities.

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22. NRDC and the Snake River Alliance filed suit in the United States Court of Appeals for the Ninth Circuit challenging the provisions of DOE Order 435.1 that relate to incidental waste on January 3, 2000.

23. After briefing, the Ninth Circuit transferred the case to this Court via an opinion dated March 28, 2001. The Ninth Circuit found that "Because DOE Order 435.1 is not a decision under Part A of Subchapter I or of any other section of the NWPA, we lack original or exclusive jurisdiction over this action." 244 F.3d 742, 747 (9th Cir. 2001). Notably, the Ninth Circuit stated "We leave issues of standing, ripeness, and of course the merits to the district court." *Id.*

A. Statutory Definition of High Level Waste

24. The NWPA was passed in 1982 when Congress recognized the growing need to identify a safe means of disposing of high-level radioactive waste derived from nuclear weapons production and commercial nuclear reactors. H.R. Rep. No 97-491, 97th Cong., 2nd Sess. at 26-30 (1982) (hereinafter "House Report"); see also Natural Resources Defense Council, Inc. v. Environmental Protection Agency, 824 F.2d 1258, 1262 (1st Cir. 1987).

25. In passing the NWPA, Congress limited its consideration of long-term disposal of high-level radioactive waste to a deep geologic repository. The reasoning behind this appears in the legislative history of the NWPA:

The Committee strongly recommends that the focus of the Federal waste management program remain, as it is today, on the development of facilities for disposal of high-level nuclear waste which do not rely on human monitoring and maintenance to keep the waste from entering the biosphere.

House Report at 29 (emphasis added).

⁴ DOE Order 435.1 is attached to this document as Attachment 1. Attachments will hereinafter be referred to as "Att. ___."

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26. With these principles in mind, Congress established elaborate mechanisms for identifying and siting repositories, research and development, environmental review, and extensive and involved public and inter-governmental processes to obtain final agreement on siting a repository. See NWPA, 42 U.S.C. §§ 10101 et seq.

27. The process of identifying and evaluating a site involves oversight and implementation by three federal agencies, the Nuclear Regulatory Commission ("NRC"), DOE, and Environmental Protection Agency ("EPA"), as well as requirements for the President to nominate (originally) three sites and to receive congressional endorsement of one of the sites, which the affected state or Indian tribe could challenge. These myriad procedures and evaluations were put in place because of the magnitude of the risks involved, because of Congress' interest in ensuring that repositories are safe, and because of the substantial public concern about high-level radioactive waste. See House Report at 26-31.

28. This case concerns DOE's interpretation of the definition of high-level radioactive waste under the NWPA, which defines high-level radioactive waste as:

(A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and

(B) other highly radioactive material that the [NRC], consistent with existing law, determines by rule requires permanent isolation.

42 U.S.C. 10101(12) (emphasis added).⁵

29. Thus, the NWPA defines high-level waste by its source—"material resulting from reprocessing." DOE defines reprocessing as a process for extracting uranium, plutonium, and other radionuclides from dissolved spent nuclear fuel and irradiated targets. The fission products

⁵ "Fission products" are radioactive elements (*e.g.*, strontium-90, cesium-137, technetium-99) that are generated when uranium atoms split ("fission") in a nuclear reaction.

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that are left behind are high-level waste. U.S. DOE Report Linking Legacies, at 221. DOE/EM-0319 (January 1997). Reprocessing waste is categorically treated as high-level waste because it is necessarily both “intensely radioactive and long-lived.” See 52 Fed. Reg. 5994.

30. After the introduction of high-level radioactive waste into the tanks, the high-level waste settles, separating into a sludge layer at the bottom of the tanks and upper layer of salts dissolved in water. Thus, the NWPA definition of high-level radioactive waste includes within it reference to "solid material derived" from the liquid effluents from reprocessing. This reflects Congress's intent to include within the definition of high-level radioactive waste all of the solid material derived from reprocessing, including that which is left in the bottom of the high-level radioactive waste storage tanks.⁶

31. Congress has authorized that the high-level radioactive waste defined under the NWPA be disposed of only at a geologic repository and that Yucca Mountain in Nevada be the site considered. 42 U.S.C. § 10172.⁷

B. Storage and Management of High-Level Radioactive Waste

32. Over the past fifty years nuclear weapons production in the United States has generated about 100 million gallons of high-level radioactive waste, which is stored at DOE sites in more than 200 tanks which range in size from a few hundred thousand gallons to more than 1 million gallons.⁸ This waste is divided between three main production sites: the Hanford

⁶ Att. 4. At Hanford, DOE acknowledges that the high-level radioactive waste solids in the tanks include slurry, sludge and saltcake. See Tank Waste Remediation System, Hanford Site, Final Environmental Impact Statement, Volume Two, Appendix A, at A-12. (August 1996).

⁷ DOE recently recommended that Yucca Mountain be considered a suitable site for the disposal of spent nuclear fuel and high level waste and the President has forwarded that recommendation to Congress. The legal and technical adequacy of that facility are irrelevant to the subject of this Complaint.

⁸ Att. 5. DOE Final Waste Management Programmatic Environmental Impact Statement, Vol. 1, 9-3 to 9-7 (1997).

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Reservation, which has 177 tanks storing more than 56 million gallons of high-level waste; the Savannah River Site, which has 51 tanks storing more than 40 million gallons of high-level waste; and INEEL, which has 11 tanks storing about 900,000 gallons of high-level waste.

33. Many of these storage tanks have leaked high-level radioactive waste. For example, at the Hanford Reservation a conservative estimate from the General Accounting Office ("GAO") states that approximately 600,000 to 900,000 gallons have leaked into the local environment directly adjacent to Columbia River from 67 tanks.⁹ Radioactive materials that have leaked include cesium, strontium, tritium, technetium, iodine, plutonium and uranium. Some of these materials remain radioactive for hundreds of thousands of years. Nonradioactive but hazardous materials that have leaked include nitrates and metals such as chromium. Id.

34. At INEEL, the DOE has acknowledged that despite limited investigations because of safety concerns, the soil surrounding the high-level waste tanks is contaminated from spills and pipeline leaks of radioactive liquids.¹⁰ Further, DOE notes that the principle threats posed by the contaminated soils are external exposure to radiation and leaching and transport of contaminants to the groundwater or to future users of the Snake River Plain Aquifer. Id.

35. At Savannah River, there are four types of high-level waste tanks.¹¹ The twelve Type I tanks were built between 1952 and 1953. Five of these tanks have leak sites in which waste leaked from the primary containment to the secondary containment (i.e., 5-foot high

⁹ GAO/RCED-98080, "Nuclear Waste - Understanding of Waste Migration at Hanford is Inadequate for Key Decisions," p. 5, March 1998 (available at <http://www.gao.gov>). The 1998 GAO report notes that these amounts do not include recent estimates using a new approach that found that radioactive leaks could be much higher on some tanks, nor does it include the radioactive wastes lost due to surface spills and leaks in pipelines. Id. at n.2.

¹⁰ Att. 6. Final Record of Decision, Idaho Nuclear Technology and Engineering Center (October 1999), at 4-1, 4-2.

¹¹ Att. 7. "High-Level Waste Tank Closure Draft EIS" DOE Savannah River Operations Office, Aiken, South Carolina, DOE/EIS-0303D, November 2000, at 1-7.

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secondary annulus “pans”). In one case the secondary containment of the tank was observed to be “degraded,” such that external water frequently leaks into the annulus.¹² Four of the leaking Type I tanks, including the tank with degraded secondary containment, sit in the water table. The four Type II tanks were built in 1956. All Type II tanks have leak sites in which waste leaked from the primary containment to the secondary containment. In one case the waste overflowed the secondary containment and leaked into the surrounding soil.

36. The eight Type IV tanks at Savannah River were built between 1958 and 1962. Two of these tanks have known leak sites and small amounts of groundwater have leaked into the tanks. Four of the Type IV tanks are in a perched water table caused by the original construction of the tank area.

37. The remaining 27 Type III tanks at the Savannah River Site are of the newest design, built between 1969 and 1986 with full-height secondary containment tanks. While none of these Type III tanks have currently known leak sites, the underground process support equipment for several tanks were found to have elevated hydrogen concentrations upwards of 45 percent of the Lower Flammability Limit, and the source of the hydrogen has not been determined.¹³

38. While liquid waste seeps from tanks and their associated pipes in Idaho, Washington and South Carolina to the surrounding environment, the concentration of radioactivity in the solids can be as high, or even higher, than the concentration of radioactivity in the materials removed from the tank after DOE implements Order 435.1 and covers the remaining waste and tanks in concrete.¹⁴

¹² Att. 8. Defense Nuclear Facility and Safety Board (“DNFSB”) 2 April 1999, SRS Report for Week Ending April 2, 1999.

¹³ Att. 9. DNFSB, 28 December 2001, SRS Report for Week Ending December 28, 2001.

¹⁴ Since the percentage of radioactivity left in the storage tanks may be more than twice the percentage of the volume of waste left in the storage tanks, the concentration of radionuclides in the remaining high-level radioactive

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C. DOE Order 435.1, the "Incidental Waste Provision" and Implementation Plans.

39. In July 1999, after a public notice and comment period, DOE promulgated Department of Energy Order 435.1 and codified its "incidental waste" provision. 64 Fed. Reg. 29393 (July 14, 1999).

40. DOE Order 435.1 and its accompanying manual (Att.2) and guidance (Att. 3) delineate radioactive waste standards, management protocols, and testing requirements for every kind of radioactive waste DOE manages within the nuclear weapons complex. The manual and guidance, in particular, contain detailed requirements for the handling of the high-level radioactive waste stored in the tanks in Washington, Idaho and South Carolina, including a process by which high-level waste may be determined to be "incidental waste" and treated as low-level waste, which exempts it from the extensive requirements of the NWPA that govern disposal of high-level radioactive waste. See Att. 2 at II-1, II-2, and Att. 3 at II-10, II-13 through II-33. It is via the incidental waste provision that DOE plans to leave the high-level waste that will remain in the tanks permanently in the ground on the respective sites.

41. According to the 435.1 Guidance, the objective of this exemption process is to dispose of "reprocessing waste streams that do not warrant geologic repository disposal because of their lack of long-term threats to the environment and man." Att. 3 at II-18 (emphasis added).

42. The Manual defines "waste incidental to reprocessing" in the following manner:

Waste resulting from reprocessing spent nuclear fuel that is determined to be incidental to reprocessing is not high-level waste, and shall be managed under DOE's regulatory authority in accordance with the requirements for transuranic waste or low-level waste, as appropriate.

waste which DOE seeks to reclassify as "incidental" may contain on average greater than twice the level of radioactivity than the high-level radioactive waste removed from the tanks. See Att. 10, NRC Review of the DOE at Savannah River High-Level Waste Tank Closure Methodology, at 8 (June 2000). The actual ratios will vary from tank to tank.

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Att. 2 at II-1.¹⁵

43. Order 435.1 creates an exemption that excludes waste explicitly covered by the NWPA definition of high-level waste (“material resulting from reprocessing”), reclassifies it as low-level (or transuranic) waste, and allows DOE unilaterally to determine whether to regulate this reprocessing waste—rather than EPA and NRC.

44. The incidental waste exemption process establishes two standards, the “citation” and “evaluation” standards, but this complaint only concerns the latter.¹⁶

45. Under the "evaluation" standard, high-level waste may be redefined as low-level waste if it meets the following criteria: (1) it is treated to reduce its level of radioactivity to the extent technically and economically practicable; (2) it is disposed in conformance with the safety requirements for low-level waste, 10 C.F.R. Part 61, Subpart C; and (3) it is solidified and does not exceed the radioactivity levels for the most radioactive category of low-level waste, referred to as the "Class C standard," set out in 10 C.F.R. § 61.55, or meets alternative requirements DOE may set. Att. 3 at II-1 (emphasis added).

46. By making compliance with the Class C standard optional — indeed completely within DOE’s own discretion — Order 435.1 creates an open-ended process for exempting high-level waste from the stringent technical and procedural requirements of the NWPA. See Att. 3 at II-27-28.

¹⁵ Transuranic waste is a category of long-lived radioactive waste that is not as intensely radioactive as high-level waste. See 42 U.S.C. § 4214ee.

¹⁶ The “citation” standard exempts certain categories of waste, including contaminated “. . . laboratory items such as clothing, tools, and equipment.” Att. 2 at II-1. The NRC proposed a similar rule in 1969, upon which the citation standard is based, but never implemented it. 34 Fed. Reg. 8712; 35 Fed. Reg. 17530. It considered such a standard again in 1987, but also withdrew it because of concerns that a numerical definition of high-level waste was “. . . an invitation to dilute or fractionate wastes solely to alter their classification.” 53 Fed. Reg. 17709 (emphasis added); see also 54 Fed. Reg. 22578; Att. 3 at II-4-5. Indeed, the dubiousness of justifying the citation part of the incidental waste standard on a rule that was not ever adopted resulted in serious criticism within DOE. See Att. 11, U.S. DOE, Response to DOE-EH Comments on High-Level Waste Issue Paper, at 1-2, 8/6/97 (comment not dated).

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47. DOE plans to use the incidental waste evaluation process to exempt materials such as reactor fuel cladding, contaminated equipment, and high-level radioactive waste it intends to abandon in the waste storage tanks at Hanford, INEEL, and Savannah River — indeed, DOE's closure plans for these facilities are premised on utilizing this exemption process. Att. 3, II-20-33.¹⁷

48. Current plans for the high-level waste tanks at the Savannah River Site illustrate how DOE applies the incidental waste exemption process. Here DOE has explicitly defined removal of 98 percent to 99 percent of the total radioactivity and over 99 percent of the volume of high level waste from the tanks as constituting "the limit of what is economically and technically practicable for waste removal," thus under their own definition potentially satisfying the first criteria under Order 435.1 for reclassification of the residual tank waste as "incidental."¹⁸ The total radioactivity in the 49 operating high-level radioactive waste tanks at the Savannah River Site is currently estimated to be 420 million Curies ("MCi").¹⁹ One to two percent of this amount, DOE's goal for high-level radioactive waste tank closure at SRS, is equal to 4-8 MCi. By comparison the radioactivity in one assembly of spent nuclear fuel irradiated in a commercial boiling water reactor is about 0.4 MCi.²⁰ In addition, the 177 high-level waste tanks at Hanford contain approximately 190 MCi of radioactivity and the 11 high-level waste tanks at INEEL

¹⁷ See, Att. 3, II-29-30, Example 2. See also, Att. 12, DOE Issue Paper, Definition of High-Level Waste and Incidental Waste Determinations at 3 (Nov. 19, 1997).

¹⁸ Att. 13. High-Level Waste Tank Closure Draft EIS, DOE Savannah River Operations Office, Aiken, South Carolina, DOE/EIS-0303D, November 2000, at 2-3.

¹⁹ Att. 14. Pacific Northwest National Laboratory website, Tank Focus Area.

²⁰ Att. 15. "Integrated Data Base Report—1994 (September 1995): U.S. Spent Nuclear Fuel and Radioactive Waste Inventories, Projections, and Characteristics" Oak Ridge National Laboratory DOE/RW-0006, Rev. 12 December 1996 at 27 and 219.

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contain approximately 5 MCi.²¹ Therefore, if one percent to two percent of the total radioactivity of the DOE high-level waste tanks is renamed "incidental waste" and left in place, this federal action is equivalent to the shallow land burial of approximately four to nine tons of spent nuclear fuel.²²

49. To date, three high-level radioactive waste tanks at the Savannah River Site have undergone closure: tank numbers 16, 17 and 20. These tank closures explicitly relied on Order 435.1, with reclassification of the residual tank waste as "incidental." These three tanks were selected for initial Department closure action in part because they were relatively clean to begin with and in two cases had been nearly empty for over a decade. The results of the tank closure process illustrate DOE's intended implementation of Order 435.1. In Tank 20 at Savannah River Site, 1,000 gallons of high-level radioactive waste remained after closure out of an initial fill of 22,000 gallons.²³ Therefore 9 percent of the initial tank waste remained in Tank 20 by volume, in contrast to DOE's goal of removing more than 99 percent of the tank waste. Similarly the residual high-level radioactive waste in Tank 17 amounted to 2,000-4,000 gallons out of an initial fill of 280,000 gallons²⁴, or 0.7 percent to 1.4 percent of the original tank volume by

²¹ Att. 14. Pacific Northwest National Laboratory website, Tank Focus Area.

²² For this calculation we use the facts that (1) one assembly of boiling water reactor spent fuel weighs about 319.9 kilograms (kg), (2) has a volume per assembly of 0.0864 m³ and (3) an activity per assembly of 1-10 MCi/m³. For pressurized water reactors these values are 657.9 kg, 0.186 m³ and 2-20 MCi/m³, respectively. See Att. 15.

²³ Much of the high-level waste was removed from Tank 20 in the mid 1980's. In 1988, the interior, including the dome and sides, was spray water washed. After spray water washing, photographs of the tank showed approximately 12,000 gallons (3.5 inches) of wash water and no observable solids. In 1990, additional water was added as ballast, brining the total liquid volume up to approximately 22,000 gallons. In 1997, prior to closure, the amount of solids remaining in the tank was approximately 1,000 gallons. Att. 16. "Industrial Wastewater Closure Module for the High-Level Waste Tank 20 System," Savannah River Site, Rev. 1, January 8, 1997 at 2-1. The ballast water had a level of radioactive of 0.1 Ci/gal. [Att. 16, Closure Module at 4-1]. The solids in Tank 20 included a wide range of radioactive hazards. See Att. 16, Closure Module at A-18.

²⁴ High level waste was also removed from Savannah River's Tank 17 in the mid 1980s. In 1986, the interior, including the dome and sides, was spray water washed. After spray water washing, photographs of the tank showed approximately 12,000 gallons (3 inches) of wash water with small amounts of solids protruding above the liquid surface. In January and February 1992, approximately 90,000 gallons of water containing tritium was placed in the

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contents. The radioactive elements in the tank heels included Selenium-79, Technetium-99, Carbon-14, Iodine-129, Plutonium (-238, -239, -240, -241 and -242), Neptunium (-237), Curium (-244 and -245) and Tritium. Att. 16 at A-18. It was estimated from process records that the approximately one-half kilogram of plutonium remained in the residual wastes in Savannah River Site tanks 17 and 20. Extrapolating this amount of plutonium per tank residue to all DOE high-level waste tanks implies that over 100 kilograms of plutonium is slated for shallow land burial under the guidelines of Order 435.1. The actual plutonium content in or near the water table at the Savannah River Site, Hanford and INEEL may be much higher, however, since the residual volume permitted under Order 435.1 depends on "the limit of what is economically and technically practicable for waste removal ... or meets alternative requirements DOE may set." See Att. 3 at II-1.

50. Regarding the third criteria for renaming residual high-level radioactive waste as "incidental" under Order 435.1 (for criteria see ¶. 45 *infra*), NRC staff notes that it will difficult for the reprocessing solids left in the high-level radioactive waste tanks at the Savannah River Site to satisfy the Class C requirements. See Att. 10 at 14-15. Here DOE plans to circumvent this impediment by claiming it is "diluting" the waste using varied kinds of grout (forms of cement) that it will pour over the remaining tank waste to stabilize and isolate it. Id., at 9-11. For the first tank closed at Savannah River, DOE assumed that there was up to 100-fold "dilution" of the waste by the added grout for the purposes of regulatory compliance.²⁵

tank for temporary storage. Other water additions were made to control corrosion which brought the total inventory to approximately 280,000 gallons. In May 1997, the contents were pumped into another tank, leaving approximately a 1-inch heel in Tank 17, which is equivalent to at least 3,400 gallons, of which at least 2,000 gallons are solids. See Att. 17, "Industrial Wastewater Closure Module for the High-Level Waste Tank 17 System" Savannah River Site, Rev. 1, April 2, 1997 at 2-1. Elsewhere, SRS has estimated the residual Tank 17 contents as 4,000 gallons. See Att. 13, HLW Tank Closure Draft EIS at 2-1.

²⁵ NRDC has calculated that in order to meet Class-C guidelines for the residual nuclear waste in some of the tanks at the Savannah River Site, upwards of about 100-fold dilution of the residual waste with reducing grout will

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51. DOE uses the term "dilution" when in reality the agency is simply averaging the concentration of radioactivity in the high-level radioactive waste solids left in the tank with the near zero concentration of radioactivity in grout. This mathematical averaging can take place under the DOE calculus even if there is no significant physical mixing of the grout and the radioactive solids (note that if DOE could mix the solids and the grout, they could readily remove those high-level radioactive solids from the tank). In essence, DOE uses the term "to dilute" when it really means "to average." However, even giving DOE the benefit of the doubt that this is a legitimate approach, there is clear evidence that mixing between the grout and remaining waste is nominal at best; thus, the premise that there is uniform mixing, and therefore "dilution," between the waste and grout is false.²⁶

52. Using this purported "dilution" or averaging method, DOE calculated that 14 of the Savannah River tanks would meet the Class C standard after bulk waste removal and water washing. Att. 10 at 11. The obvious corollary to this is that the remaining 37 tanks would require further cleaning even if the remaining reprocessing waste is assumed to be "diluted" by the added grout. Id. at 14. Despite not being able to meet the Class C standard in 37 of the tanks, DOE has requested that the NRC exempt it from having to undertake this additional cleaning. Id.

53. Thus, under DOE's most recent preferred plan for the Savannah River tanks, after closure of all of the tanks, reprocessing waste left in 14 of the tanks may meet the Class C

be required. This calculation relies on NRC's statement that for these tanks "between 0 and 31 inches of grout" will be required "to meet the Class C limits." See Att. 10 at 11. The tanks at Savannah River are between 75 and 85 feet in diameter. See Att. 18, "Industrial Wastewater Closure Plan for F- and H-Area High-Level Waste Tank Systems" Savannah River Site Rev. 1 July 10, 1996. Therefore 31 inches of grout will occupy a volume of between 85,000 gallons and 110,000 gallons. Assuming that approximately 1,000 gallons of high-level waste remains in the tank after closure, this implies up to 100-fold dilution of the waste by the grout.

²⁶ See also Att. 19, DNFSB, Savannah River Report for Week Ending March 14, 1997 (1997) and DNFSB, Savannah River Report for Week Ending Aug. 15, 1997 (1997).

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standard after DOE performs its averaging process. Thirty seven of the tanks will not meet the Class C standard even if it is assumed to be "diluted" more than a 100-fold. DOE also plans to monitor and maintain the tanks and to impose land-use restrictions around them in perpetuity.

Att. 10, NRC Review at 28.

54. The plans for grouting and then covering the waste in concrete is similar for INEEL and the Hanford Reservation. The volume of waste that DOE plans to abandon in the high-level waste tanks at all three sites is significant, and may even be growing substantially as a result of the newly announced DOE policies. In a November 2001 memo signed by the Assistant Secretary for Environmental Management (Att. 20 at 3), DOE suggests that it will eliminate the need to vitrify at least 75 percent of the waste in the high-level radioactive waste tanks. Whether DOE drains 95 percent of the liquid waste from the tanks for vitrification or 25 percent of the waste, the radioactivity that will remain in each tank is (1) high-level radioactive waste derived from reprocessing that, pursuant to the NWRPA, must be disposed of in a geologic repository; and (2) equivalent to leaving several tons of power-reactor spent nuclear fuel in shallow land burial directly adjacent to vital human and environmental resources.

CLAIMS FOR RELIEF

First Claim for Relief

55. Plaintiffs incorporate by reference paragraphs 1 through 54.

56. The incidental waste exemption created under DOE Order 435.1, which reclassifies high-level radioactive waste as low-level radioactive waste according to criteria solely with DOE's discretion, circumvents the extensive congressionally mandated processes for the disposal of high-level radioactive waste mandated by the NWRPA. 42 U.S.C. §§ 10101 et seq.

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57. Under Order 435.1, DOE attempts to avoid the requirements of the NWPA by claiming that certain high-level reprocessing waste is excluded from the statutory definition of high-level radioactive waste. DOE Order 435.1 violates the plain language of NWPA by allowing thousands of cubic meters of intensely radioactive reprocessing sediments to be excluded from the NWPA definition of high-level waste, and thus, from disposal in a geologic repository. 42 U.S.C. 10101(12).

58. DOE's interpretation of the NWPA is fundamentally flawed. First, the reprocessing solids (i.e., slurry, sludge, and saltcake) in the storage tanks are, by definition, "radioactive material resulting from the reprocessing of spent nuclear fuel . . . and any solid material derived from such liquid waste that contains fission products in sufficient concentrations" under the NWPA and therefore cannot be treated as low-level waste. The waste DOE plans to abandon in the tanks undeniably resulted from reprocessing and therefore, under the statutory definition of high-level radioactive waste, is indistinguishable from the rest of the high-level radioactive waste in the tanks. Id.

59. Second, DOE's application of its incidental waste exemption is fundamentally inconsistent with the fact that, because the radioactive elements in the high-level tank radioactive waste concentrate in the solids (i.e., slurry, sludge, and saltcake), the reprocessing waste that will be abandoned in the storage tanks contains equal to or greater concentrations of radioactive elements than the waste removed for disposal in a geologic repository. It is utterly illogical and technically unjustifiable to treat such intensely radioactive waste as not being subject to the NWPA.

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60. Third, even if the remaining high-level radioactive waste could be construed as "solid material derived from" the other reprocessing waste, the concentration of fission products is more than sufficient to satisfy the definition of high-level radioactive waste under the NWPA.

61. DOE's incidental waste rule is contrary to the express intent of Congress that radioactive waste "resulting from reprocessing" be permanently isolated from the environment, that its disposal comply with the extensive testing and procedural requirements of the NWPA, and that it be externally regulated by the NRC and EPA. It also overrides an express categorical requirement that all waste resulting from reprocessing be subject to the NWPA and replaces it with an arbitrary and unlawful determination process that is exclusively within DOE's discretion to apply. This exemption process is particularly significant because both the volume of waste and its level of radioactivity belie any DOE claims that the reprocessing waste it will exempt under this rule is de minimis.

62. Defendants' promulgation and implementation of DOE Order 435.1 is arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with the law in violation of the APA, 5 U.S.C. § 706.

PRAYER FOR RELIEF

Plaintiffs and their members have no adequate remedy at law. In the absence of injunctive relief, members of NRDC and the Snake River Alliance and citizens of the Yakama Nation will be forever exposed to the permanent emplacement of highly radioactive waste alongside the Columbia River, above the Snake River Aquifer, and in the water table adjacent to the Savannah River.

WHEREFORE Plaintiffs pray this Court afford the following relief:

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63. A declaratory judgment declaring that DOE has violated the NWPA, 42 U.S.C. §§ 10101 et seq., by promulgating DOE Order 435.1 as it relates to incidental waste;

64. A declaratory judgment declaring that DOE Order 435.1 constitutes agency action not in accordance with the law, and agency action in excess of statutory jurisdiction, authority, or limitations, or short of statutory right, which is unlawful and shall be set aside under the APA, 5 U.S.C. §701 et seq.

65. A permanent injunction preventing DOE taking any action with respect to waste in the tanks that would be inconsistent with the requirements for high-level radioactive waste disposal under the NWPA;

66. A permanent injunction preventing DOE from taking any actions that include, but are not limited to, grouting with concrete for "permanent disposal" any additional high-level radioactive waste tanks in Washington, Idaho, and South Carolina;

67. An order providing that this Court shall retain jurisdiction over this matter pending compliance with its order;

68. Reasonable attorney's fees and costs; and

69. Such other relief as this Court deems just and proper.

Respectfully submitted,

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Dated: February 28, 2002

CERTIFICATE OF SERVICE

I hereby certify that I caused a true and correct copy of this document to be served via Messenger Service to the following counsel this day of February 28, 2002.

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Warning

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NRDC v. Abraham

United States District Court for the District of Idaho

August 9, 2002, Decided; August 9, 2002, Filed

Case No. CV-01-413-S-BLW

Reporter

2002 U.S. Dist. LEXIS 28418 *

NATURAL RESOURCES DEFENSE COUNCIL, INC.; CONFEDERATED TRIBES & BANDS OF THE YAKAMA NATION; SNAKE RIVER ALLIANCE; and SHOSHONE-BANNOCK TRIBES, Plaintiffs, v. SPENCER ABRAHAM, Secretary, Department of Energy; and UNITED STATES OF AMERICA, Defendants.

Subsequent History: Summary judgment granted by, Judgment entered by, Motion to strike denied by, As moot, Motion granted by, Dismissed by [Natural Res. v. Abraham, 271 F. Supp. 2d 1260, 2003 U.S. Dist. LEXIS 17154 \(D. Idaho, 2003\)](#)

Prior History: [Natural Res. Def. Council v. Abraham, 244 F.3d 742, 2001 U.S. App. LEXIS 4945 \(9th Cir., 2001\)](#)

Core Terms

high-level, radioactive waste, disposal, judicial review, requirements, site, agency's action, ripe, issues, law of the case doctrine, contractors, facilities, repository, purposes, tanks, incidental, Tribe, promulgation, compliance, directive, merits

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Judges: B. LYNN WINMILL, United States District

Court Chief Judge.

Opinion by: B. LYNN WINMILL

Opinion

MEMORANDUM DECISION AND ORDER

INTRODUCTION

The Court has before it a Motion to Dismiss filed by Defendants Spencer Abraham, Secretary of the Department of Energy, and the United States [*3] of America, pursuant to [Federal Rule of Civil Procedure 12\(b\)\(6\)](#). The Court has heard the oral argument of counsel, reviewed and considered all of the parties' filings, and given serious consideration to the difficult issue presented. For the following reasons the Court will deny Defendants' Motion to Dismiss.

BACKGROUND

This case was transferred to this Court by the Ninth Circuit. See [NRDC v. Abraham, 244 F.3d 742 \(9th Cir. 2001\)](#). In its opinion, the Circuit found that it lacked original or exclusive jurisdiction under [42 U.S.C. § 10139](#) to entertain Plaintiffs' claims because the decision by the DOE in promulgating Order 435.1 was not made pursuant to the Nuclear Waste Policy Act, [42 U.S.C. §§ 10101 et seq.](#) See [id. at 747](#). However, the Ninth Circuit expressly noted that issues relating to standing, ripeness, and the merits of the Plaintiff's claims must be decided by this Court. See [id.](#)

Plaintiffs' Complaint alleges that DOE Order 435.1 violates the NWPA and the Administrative Procedures Act, [5 U.S.C. §§ 701 et seq.](#), because it allows DOE radioactive waste facilities, as well as DOE contractor facilities, to reclassify high-level radioactive waste as "incidental waste" or "waste incidental [*4] to reprocessing," ("WIR"). Plaintiffs argue that the motive for this reclassification is to exempt high-level waste from the application of the more stringent disposal provisions found in the NWPA. ¹

¹ Plaintiffs allege that "incidental waste," as it is defined by Order 435.1, is high-level waste and that, absent a presidential directive to the contrary, the NWPA mandates that all high-level radioactive waste must be disposed of in geologic

Plaintiffs' Complaint alleges that the incidental waste provision of Order 435.1 establishes two standards: the "citation" standard and the "evaluation" standard. ²

Under the "evaluation" standard, high-level waste may be re-categorized as low-level or transuranic waste if: (1) it is treated to reduce its level of radioactivity to the extent technically and economically practicable; (2) it is disposed of according to the requirements for the disposal of low-level waste; and (3) it is solidified and is no more radioactive than the highest category of radioactivity for low-level waste, or it meets other criteria established by the DOE. DOE Manual 435.1-1 [*5] at II-2 (emphasis added).

Plaintiffs urge that such a standard makes DOE compliance with the NWPA optional. They claim that they will suffer direct and immediate harm if the Defendants are allowed to follow Order 435.1 because it will allow the DOE to permanently store high-level radioactive waste, i.e., high-level waste that has been reclassified as "incidental waste," in concrete storage tanks ³

rather than removing the waste and shipping it to geologic repositories as required by the NWPA. See [42 U.S.C. § 10107](#). They assert that leaching, i.e., spilling, of high-level waste has occurred at the three DOE sites—Hanford, Savannah River, and INEEL—and that it will inevitably continue into the future. See Plaintiffs' Complaint, P's 33-38.

The Plaintiffs have moved for declaratory and injunctive relief pursuant to [5 U.S.C. § 706](#) of the APA. They seek a ruling by the Court invalidating Order 435.1 as arbitrary, capricious, and contrary [*6] to law. Plaintiffs argue that a permanent injunction should issue that would prohibit the DOE from taking any action with respect to radioactive waste in the tanks at the three DOE sites that is inconsistent with the requirements of the NWPA governing the disposal of high-level waste. Specifically, the Plaintiffs request that the Court issue a permanent injunction preventing the Defendants from "grouting" with concrete for permanent disposal any additional high-level radioactive waste tanks at the three

repositories established by the Act. See Plaintiff's Complaint, P 5; see also [42 U.S.C. 10107\(b\)\(2\)](#).

² Plaintiffs do not challenge the validity of the "citation" standard in their complaint.

³ Storage is done by a process known as "grouting" in which the residue high-level waste is mixed with cement and the tank is then essentially filled with cement and sealed.

sites in Washington, South Carolina, and Idaho. In addition, the Plaintiffs request that the Court retain jurisdiction over this proceeding to ensure future compliance by the Defendants with the Court's orders. See Plaintiffs' Complaint, P's 63-69.

DISCUSSION

The Defendants Motion to Dismiss advances several arguments for dismissing the Plaintiffs' Complaint. First, the Defendant argues that Order 435.1 should not be considered "final agency action" for purposes of judicial review. Second, they contend that the case is not "ripe" for judicial review until the DOE or one of its contractors actually applies the Order on a case specific basis. Third, they suggest that the Law of the Case [*7] Doctrine prevents the Court from assuming jurisdiction over the Plaintiff's claims. Finally, they contend that the Plaintiffs' Complaint fails to state a claim upon which relief may be granted. The Court will address each of these arguments in turn.

1. DOE Order 435.1 Constitutes "Final Agency Action" for Purposes of Judicial Review.

"Final agency action" is characterized by two criteria: (1) "the action must mark the consummation of the agency's decisionmaking process," e.g., not merely of a "tentative or interlocutory nature;" and (2) "the action must be one by which rights or obligations have been determined, or from which legal consequences flow." [Bennett v. Spear, 520 U.S. 154, 177-78, 117 S. Ct. 1154, 137 L. Ed. 2d 281 \(1997\)](#). Defendants argue that Order 435.1 does not constitute "final agency action" because the Order, along with its accompanying Guidance and Manual, are merely tools used by the DOE facilities to manage radioactive waste. In the Defendants' view, the Plaintiffs can not show any immediate or direct impact from the Order. According to the Defendants, the Order isn't self-executing and doesn't determine which waste is "waste incidental to reprocessing;" rather, such decisions will be made on a "case-by-case" [*8] or "waste stream by waste stream basis." Defendants allege that the Order has yet to be applied by the DOE and therefore represents only the DOE's policy concerning its waste-management authority.

Courts have generally interpreted the "finality" element in a flexible and pragmatic way. See [Abbott Labs. v. Gardner, 387 U.S. 136, 149, 87 S. Ct. 1507, 18 L. Ed.](#)

[2d 681 \(1967\)](#). While Order 435.1 may or may not be final agency action in the "highly technical sense" because it has yet to be applied by the DOE or one of its constituents, common sense dictates that the Order itself represents the DOE's final interpretation of its statutory mandate. See [Comm. for Idaho's High Desert v. Collinge, 148 F.Supp 2d 1097, 1100 \(D. Idaho 2001\)](#) (Holding that the implementation of a predator control program was a "contingent future event" in a "highly technical sense" but in common terms it was inevitable.) The relevant agency action involved in this case is the promulgation of the Order 435.1 itself and not the subsequent actions to be made pursuant to that Order.

Order 435.1 is not merely an intermediate step as Defendants' claim. See [Abbott Labs., 387 U.S. at 148-49](#). In fact, following a lengthy development period of more than eight years, [*9] Order 435.1 was published in the Federal Register. See [64 Fed. Reg. 29393](#); see also [Whitman v. Am. Trucking Ass'ns, 531 U.S. 457, 477-78, 121 S. Ct. 903, 149 L. Ed. 2d 1 \(2001\)](#) (Finding that publication in the Federal Register of an EPA implementation policy was an indicator that the agency's action was final.) The deliberate nature of the DOE's decision in promulgating the Order is informative because it suggests that the DOE was well aware that "rights or obligations" would ultimately be determined by the Order.

The language utilized in the DOE Order, Guidance, and Manual is specific and mandatory in nature. DOE Manual 435.1-1 states that "implementation of the requirements *shall* begin at the earliest possible date, and all DOE entities *shall* be in compliance with this directive within one year of its issuance" DOE Manual 435.1-1 at i (emphasis added). This express language contradicts Defendants' argument that DOE officials and contractors are vested with the unfettered discretion to apply Order 435.1 as they see fit. In fact, DOE waste facilities and contractors are subject to "corrective actions whenever necessary" to ensure that the "requirements of DOE O[rder] 435.1 . . ." are met. DOE Manual 435.1-1 [*10] at III-3, IV-2.

The Court finds that DOE Order 435.1 is a final expression of the agency's interpretation of its congressional mandate to manage and dispose of radioactive waste. The Court also finds that the Order is non-discretionary in that the various DOE officials and contractors are not free to act in contravention of the Order without risking possible "corrective actions" being levied upon them by the DOE. Consequently, the Court finds that DOE Order 435.1 constitutes final agency

action for purposes of judicial review.

2. The Issues Raised are Ripe for Judicial Review.

When undertaking a ripeness analysis, the Court must "evaluate both the fitness of the issues for judicial decision and the hardship to the parties of withholding court consideration." [*Whitman v. Am. Trucking Ass'ns*, 531 U.S. 457, 479, 121 S. Ct. 903, 149 L. Ed. 2d 1 \(2001\)](#). In making this analysis, the Court must avoid letting judicial review interfere with subsequent agency action. See *id.*; see also [*Ohio Forestry Ass'n v. Sierra Club*, 523 U.S. 726, 737, 118 S. Ct. 1665, 140 L. Ed. 2d 921 \(1998\)](#).

The Defendants mirror their previous argument and insist that Order 435.1 is not ripe for judicial review because no component of the DOE has applied the WIR process defined in the Order. [*11] In making this argument, they rely largely upon the Supreme Court's opinion in [*Ohio Forestry Ass'n v. Sierra Club*, 523 U.S. 726, 737, 118 S. Ct. 1665, 140 L. Ed. 2d 921 \(1998\)](#), which outlined three primary ripeness considerations: (1) the hardship to plaintiffs if review is delayed; (2) whether judicial review would interfere with subsequent agency action; and (3) whether it would benefit the court to allow further factual development of the issues involved.

Under this standard, Defendants contend that the Plaintiff's claims are not ripe for judicial review, but are based upon sheer speculation about what the DOE might do; that until the DOE actually applies the Order, the "plans" at the Savannah River Site, Hanford, and INEEL cause no immediate harm. In other words, there is no immediate harm until the DOE or one of its elements makes a decision at a particular site. Further, Defendants contend that the Plaintiffs can't define any future harm that would occur from postponing review until future administrative decisions have taken place and the facts have been developed.

However, the Defendants' position seems to be at odds with the undisputed facts and the Plaintiff's allegations. Order 435.1 appears to be a definitive [*12] position by the Defendants as to the reclassification of high-level waste, which was created following almost nine years of development, including a notice and comment period. The WIR process has already been applied twice in South Carolina at the Savannah River Site prior to the promulgation of Order 435.1 and the Plaintiffs allege that DOE's future tank cleanup program is largely

premised upon Order 435.1 and its accompanying Guidance and Manual.⁴

Moreover, delaying review of Order 435.1 until the DOE makes a site specific decision in conformance with the Order may cause substantial harm. Tank closures, once undertaken, aren't readily altered and future judicial review may therefore be foreclosed until it is too late.⁵

The Court need not wait until a threatened injury comes to fruition before undertaking judicial review. This is particularly true where the DOE Order has the force of law and requires immediate compliance by DOE facilities as well [*13] as DOE contractors. In such a case, a justiciable controversy exists that is ripe for review, because the Court can "firmly predict" the result that would occur through the application of Order 435.1. See [*Freedom to Travel Campaign v. Newcomb*, 82 F.3d 1431, 1436 \(9th Cir. 1997\)](#) (citing [*Reno v. Catholic Social Services*, 509 U.S. 43, 69, 113 S. Ct. 2485, 125 L. Ed. 2d 38 \(1993\)](#) (O'Connor, J., concurring); see also [*Thomas v. Union Carbide Agricultural Products Co.*, 473 U.S. 568, 581-82, 105 S. Ct. 3325, 87 L. Ed. 2d 409](#) ("One does not have to await the consummation of threatened injury to obtain preventive relief. If the injury is certainly impending, that is enough.")).

In short, the Court concludes that there is a clear indication of the hardship that plaintiffs and the intervenors will suffer if review is delayed, there is no indication that undertaking judicial review at this juncture would interfere with subsequent agency action, and the Court perceives no benefit which would be obtained by allowing further [*14] factual development of the issues involved. Under such circumstances, the Court concludes that Order 435.1, and its mandate that all DOE contractors and entities comply with its provisions, are ripe for judicial review. [*Ohio Forestry Ass'n*, 523 U.S. at 737](#).

3. The Law of the Case Doctrine Does Not Prevent the Court from Considering the Plaintiff's Claims.

⁴ Plaintiffs have acknowledged that the Defendants have yet to apply the "WIR" process found in Order 435.1 and reclassify high-level waste at the three facilities as low-level waste for purposes of disposal. See Plaintiffs' Complaint, P 40

⁵ The Court notes that counsel for Plaintiffs suggested during oral argument that the closure of two tanks at Savannah River occurred under circumstances in which they were unable to bring a timely action to obtain judicial review of that decision.

The law of the case doctrine requires that a district court respect prior rulings issued by circuit courts on issues of law. See [United States v. Hatter, 532 U.S. 557, 565-66, 121 S. Ct. 1782, 149 L. Ed. 2d 820 \(2001\)](#) (emphasis added). Defendants' contend that the doctrine precludes this Court from assuming jurisdiction over this matter because the Ninth Circuit has already ruled that DOE Order 435.1 is not a decision under any part of the NWPA. See [NRDC, 244 F.3d at 747](#).

However, this is a misapplication of the law of the case doctrine. First, the doctrine simply does not apply where an appellate court or the Supreme Court has not issued a ruling on the merits. "The law of the case doctrine presumes a hearing on the merits." [Hatter, 532 U.S. at 566](#). Prior to remanding this case to the District Court of Idaho, the Ninth Circuit specifically left open the issues of standing, [*15] ripeness, and the merits for a decision by this Court. See [NRDC, 244 F3d at 747](#).

The inapplicability of the law of the case doctrine is also indicated by the nature of the Ninth Circuit's decision to remand this case to the District Court rather than dismissing the action altogether. The Ninth Circuit remanded this case because the NWPA's provision vesting original and exclusive jurisdiction in the Circuit Court is limited to cases arising *under* the NWPA, not because the Plaintiffs' Complaint did not in any way implicate the NWPA as the Defendants have suggested in their pleadings. See *id*; see also [42 U.S.C. § 10139\(a\)\(1\)\(A\)](#). Therefore, the Court finds that the law of the case doctrine is not applicable.

4. The Plaintiffs' Have Made Cognizable Claims Upon which Relief May be Granted.

In deciding whether a plaintiff has stated a claim upon which relief may be granted, the Court must accept all of the plaintiff's factual allegations as true and construe them in the light most favorable to the Plaintiff. See [Epstein v. Washington Energy Co., 83 F.3d 1136, 1140 \(9th Cir. 1999\)](#) (citation omitted). There are very few factual disputes in this case. The problems that are to be resolved by the [*16] Court are legal in nature and, more succinctly, pertain to statutory interpretation. Currently, both the Atomic Energy Act and the NWPA have provisions that either directly address or allude to the characterization of radioactive waste.

It is the Defendants' contention that the Plaintiff's Complaint cannot possibly state a claim upon which relief can be granted because the actions they object to

do not pertain to the statute cited in their Complaint. The DOE asserts that its waste management activities are governed solely by the AEA and the Energy Reorganization Act. However, the Court has heretofore been unable to find a substantive provision of the AEA specifically delegating waste characterization or classification authority to the agency. Defendants have cited [42 U.S.C. 2201\(j\)\(3\)](#) which delegates authority to the DOE to issue Orders and Directives that "*govern any activity authorized pursuant to this Act [AEA], including standards and restrictions governing the design, location, and operation of facilities used in the conduct of such activity, in order to protect health and to minimize danger to life or property.*" (Emphasis added).

The statutory language of the NWPA, which was passed [*17] by Congress almost thirty years subsequent to the passage of the AEA, contradicts the Defendants' argument that the AEA exclusively governs the disposal of high-level waste. The NWPA defines the term "disposal" in plain language: ". . . [T]he emplacement in a repository of high-level radioactive waste, spent nuclear fuel, or other highly radioactive material with no foreseeable intent of discovery" [42 U.S.C. § 10101\(9\)](#). Moreover, the AEA has specifically adopted the definitions of "high-level radioactive waste" and "spent nuclear fuel" included in the NWPA. See [42 U.S.C. § 2014\(dd\)](#).

The Court cannot find, as a matter of law, that DOE Order 435.1 classifies waste as WIR exclusively for management purposes and without regard for the statutory and regulatory requirements for disposal of high-level radioactive waste. Likewise, the Court cannot rule out the possibility that Order 435.1 will be used, as the Plaintiffs fear, as a tool to circumvent the more stringent disposal requirements of the NWPA. In short, Order 435.1, and its accompanying Manual and Guide, necessarily implicates the disposal provisions found in the NWPA by reclassifying high-level waste as low level waste.

Furthermore, [*18] the DOE doesn't have unconstrained authority to dispose of high-level waste as the Defendants claim.⁶

Unless the President finds otherwise, defense high-

⁶The Court notes that the Defendants have acknowledged in their memorandum that a presidential directive could provide that the DOE dispose of defense high-level waste at a civilian repository constructed pursuant to the NWPA. See Defendants' Memo at 20, n. 13 (Docket No. 20).

level waste must be disposed of in civilian repositories established by the NWPA. [42 U.S.C. § 10107\(b\)\(2\)](#); see also [NRDC, 244 F.3d at 744](#). A Presidential Directive issued by President Reagan on April 30, 1985 determined that there was no basis for establishing a repository for Department of Defense high-level waste. Therefore, DOD high-level waste cannot be disposed of in any other place other than a repository established under the NWPA unless the President makes a finding to the contrary at some time in the future.

The language, purpose, and history of the NWPA make clear that Congress didn't intend that DOE's compliance with the NWPA to be voluntary. Additionally, any finding that the WIR evaluation process operates solely under the authority of the AEA would [*19] render the NWPA meaningless. The legislative history reveals that the NWPA was enacted in direct response to "the need to address problems besetting *nuclear waste management* . . ." H.R. Rep. No 97-491, 97th Cong., 2nd Sess. at 26 (1982) (emphasis added). In light of this background, it is inconceivable that Congress intended to allow the DOE unfettered discretion in the management of radioactive waste as the Defendants have alleged.

The Court recognizes that a high degree of deference should be given to the DOE's interpretation of statutes such as the AEA and the NWPA. See [Forest Guardians v. Dombeck, 131 F.3d 1309, 1311 \(9th Cir. 1997\)](#). The Court should not substitute its own construction unless the statute is silent or ambiguous on the matter and the agency's interpretation is not a "permissible construction." See [Chevron v. NRDC, 467 U.S. 837, 842-43, 104 S. Ct. 2778, 81 L. Ed. 2d 694 \(1984\)](#). However, agency constructions that are "contrary to congressional intent" must be rejected by the Court. See *id.* (citations omitted).

The NWPA is neither silent, nor ambiguous on the classification of radioactive waste. The definitions section of the NWPA necessarily involves the manner in which the DOE should classify radioactive [*20] waste. See [42 U.S.C. § 10101\(12\)](#). If Congress had intended to allow the DOE complete discretion as to the classification of radioactive waste for management purposes it is highly unlikely that it would have included the meaning of high-level waste in the NWPA's definitions section. See *id.* By defining a specific class of radioactive waste, i.e., high-level radioactive waste, Congress has issued a de facto limitation upon the DOE's authority to classify radioactive waste for management purposes. Therefore, the Court finds that the Plaintiffs' Complaint includes cognizable claims

upon which relief may be granted.

5. The Plaintiffs Meet the Requirements for Standing.

Upon referral, the Ninth Circuit left issues of standing to be decided by this Court. See [NRDC, 244 F.3d at 747](#). The parties have not raised the issue of standing in their various pleadings to the Court. Nevertheless, the Court is required to address the issue of standing *sua sponte* and will therefore discuss it briefly herein. See [Bernhardt v. County of L.A., 279 F.3d 862, 868 \(9th Cir. 2002\)](#) (citation omitted).

In order to meet the requirements for standing, a Plaintiff must show: (a) "an invasion of a legally protected interest [*21] which is concrete and particularized"; (b) that such an interest is "actual or imminent, not conjectural or hypothetical"; and c) "it must be likely, as opposed to merely speculative, that the injury will be redressed by a favorable decision." [Lujan v. Defenders of Wildlife, 504 U.S. 555, 560, 112 S. Ct. 2130, 119 L. Ed. 2d 351 \(1992\)](#) (citations and internal quotation marks omitted). The Plaintiffs bear the burden of establishing these elements. See *id.* at 561.

"An association has standing to bring suit on behalf of its members when its members would otherwise have standing to sue in their own right," the interests at stake relate to the organization's purpose, and "neither the claim asserted nor the relief requested requires the participation of individual members in the lawsuit." [Friends of the Earth, Inc. v. Laidlaw Envtl. Servs. \(TOC\), Inc., 528 U.S. 167, 181, 120 S. Ct. 693, 145 L. Ed. 2d 610 \(2000\)](#) (citation omitted).

The named Plaintiffs in this case included two environmental groups, Natural Resources Defense Council (NRDC) and Snake River Alliance, and two Indian tribes, Confederated Tribes & Bands of the Yakama Nation and the Shoshone-Bannock Tribe. Plaintiffs' asserted interests include, but are not limited to, the protection of water resources, [*22] the maintenance of healthy fisheries, and general concerns for human safety and welfare.

NRDC has a nationwide membership of more than 390,000 individuals, including over 20,000 members in the states of Idaho, South Carolina, and Washington. They have a long history of environmental advocacy and monitoring federal agency actions concerning the environment.

Snake River Alliance is an Idaho-based environmental group with over 1,000 members, mostly southern Idahoans. Many of its members are directly affected by the INEEL site because the site is located on top of the Snake River aquifer. The aquifer supplies much of the drinking water and irrigation for the state of Idaho. (Docket No. 10).

The Yakama Nation is a federally recognized Indian tribe. The Yakama hold treaty rights to fish in the Columbia River Basin. A portion of the Hanford site ("Hanford Reach") includes spawning areas for chinook salmon. Fishing has long played a substantial role in the Yakama culture. (Docket No. 10).

The Shoshone-Bannock Tribe is a federally recognized Indian tribe located in the state of Idaho. The Shoshone-Bannock assert a legal right, secured by treaty, to fish for rainbow trout and sturgeon below Shoshone [*23] Falls on the Snake River in Idaho. The Shoshone-Bannock express concern over the threat of high-level hazardous waste from the INEEL site contaminating the groundwater which feeds the Snake River. They are also concerned about the impact that DOE Order 435.1 may have upon health of Tribal members "in and about the Snake River." See Memo. in Support of Motion to Intervene at 2-3 (Docket No. 14).

The improper disposal of high-level radioactive waste poses a serious threat to the Plaintiffs collective interests. It is abundantly clear that the Plaintiffs can demonstrate an imminent threat to a legally protected interest and that threat can be positively traced to the promulgation of Order 435.1. Additionally, a favorable ruling will more likely than not accomplish the remedy sought by the Plaintiffs, e.g., prevent the disposal of high-level radioactive waste on-site at Hanford, Savannah River, and INEEL. See [Clinton v. City of New York, 524 U.S. 417, 430, 118 S. Ct. 2091, 141 L. Ed. 2d 393 \(1998\)](#) (citation omitted). The Court therefore finds that the Plaintiffs' have standing to pursue this action.

CONCLUSION

Therefore, pursuant to its review authority under 5 U.S.C. §§ 704 & 706, the Court will Deny the Defendants' Motion [*24] to Dismiss. However, in denying the Defendants' motion the Court makes no ruling as to the merits of the Plaintiffs' claims.

ORDER

NOW THEREFORE IT IS HEREBY ORDERED, that Defendants' Motion to Dismiss (Docket No. 16) is hereby DENIED.

Dated this 9th day of August, 2002.

/s/ B. Lynn Winmill

B. LYNN WINMILL

Chief Judge, United States District Court

End of Document

U.S. Department of Energy Defense Waste: Select Bibliography

“Research, development, testing, and production of US nuclear weapons occurred at thousands of sites in nearly every state, as well as Puerto Rico, the Marshall Islands, Johnston Atoll, and Christmas Island in the Pacific. Between 1940 and 1996, the United States spent approximately \$5.8 trillion dollars to develop and deploy nuclear weapons. As a result, the nuclear weapons program created one of the largest radioactive waste legacies in the world—rivaling the former Soviet Union’s.

US nuclear weapons sites—many of them under the aegis of the Energy Department—constitute some of the most contaminated zones in the Western hemisphere, and attempts to remediate those sites are now approaching their fifth decade. It is the most costly, complex, and risky environmental cleanup effort ever undertaken, dwarfing the cleanup of Defense Department sites and the Environmental Protection Agency’s Superfund program. Long-term liability estimates range from approximately \$300 billion to \$1 trillion. Site remediation and disposition of radioactive detritus are expected to continue well into this century. After that, long-term stewardship of profoundly contaminated areas will pose a challenge spanning hundreds of centuries.”

Robert Alvarez, [“A primer: Military nuclear wastes in the United States,”](#) *Bulletin of the Atomic Scientists*, February 24, 2014.

“It’s a surprise when there are no surprises,” a cleanup worker told me a few years ago at the Hanford site in Washington state, once the world’s largest producer of plutonium for nuclear weapons and now home to a massive effort to stop leaking nuclear waste tanks from poisoning the Columbia River. This maxim can hold painfully true for a variety of events assigned an extremely small chance of happening. On February 4, 2014, assumptions of very low probability crumbled at the Energy Department’s Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico, when a fire in a large salt truck raged for hours, deep underground.

Ten days later, an even more unlikely accident happened: Wastes containing plutonium blew through the WIPP ventilation system, traveling 2,150 feet to the surface, contaminating at least 17 workers, and spreading small amounts of radioactive material into the environment.”

Robert Alvarez, [“The WIPP problem, and what it means for defense nuclear waste disposal,”](#) *Bulletin of the Atomic Scientists*, March 23, 2014.

“... the Y-12 nuclear weapons site Oak Ridge, Tenn., has abandoned contaminated structures, mostly built in the 1940’s, that inhabit a footprint 2.5 times larger than the Pentagon building. In December 2016, the cost to get rid of 2,349 Energy Department abandoned facilities over the next 10 years was roughly estimated at \$32 billion. The Energy Department reports that among

those buildings are 203 unattended "high risk" facilities, estimated to cost \$11.6 billion to deal with. And sometimes the risk becomes reality, the most recent example being the collapse of the PUREX Tunnel at the Hanford Site in Washington State; the tunnel holds an enormous amount of radioactive waste, and its collapse forced workers to seek cover at the Hanford site. The Energy Department estimates that another 1,000 abandoned facilities will be added to the list of those needing cleanup over the coming decade. Disposition costs for the large amounts of hazardous wastes in the abandoned structures are not included in the department's 2016 estimate and are likely to add several billion dollars more to the ultimate bill."

Robert Alvarez, "[Yesterday is tomorrow: estimating the full cost of a nuclear buildup](#)," *Bulletin of the Atomic Scientists*, November 3, 2017.

The amount of plutonium discarded as wastes from the U.S. nuclear weapons complex appears to be significantly greater than the U.S. Department of Energy's 1996 declaration of its plutonium holdings. This is due to in part to improved radioactive waste characterization and the disposal of plutonium residues originally intended for use in weapons. The Hanford site in Washington State has the largest quantity of plutonium wastes, which pose potentially serious human risks to ground water and the near shore the Columbia River. The department should revise its accounting for plutonium, and take steps to remove plutonium discarded to the environment at Hanford, as it is required to do at Idaho National Laboratory.

Alvarez, Robert. "[Plutonium wastes from the US nuclear weapons complex](#)." *Science & Global Security* 19.1 (2011): 15-27.

High-level radioactive wastes resulting from plutonium production at the U.S. Department of Energy's (DOE) Hanford site in Washington State are among the largest and most dangerous byproducts of the nuclear arms race. The Energy department announced plans in 2002 to terminate its environmental mission at Hanford and all other DOE sites over the next 30 years. During this time, DOE intends to dispose of approximately 90 percent of Hanford's high-level wastes onsite, process the remainder into glass for geological disposal, and permanently close 177 large tanks, and related infrastructure. Central to the department's goal at Hanford is to speed up, perhaps, the most expensive, complex, and risky environmental project in the United States. Estimated life-cycle costs for processing Hanford's wastes are between \$41.6 and \$56.9 billion. No country has processed anything quite like Hanford's large and complex brew of wastes.

Robert Alvarez, "Reducing the Risks of High-Level Radioactive Wastes at Hanford," *Science & Global Security*, 13, no. 1-2, (2005): 43-86.

"On July 16, 1973, 28 years to the day after the first nuclear weapon was exploded at Alamogordo, New Mexico, a line of dump trucks containing the detritus from the uranium used

to make plutonium for the test bomb showed up at the West Lake landfill in Bridgeton, Missouri. Assuming the trucks were loaded with clean fill, the landfill superintendent waved them through without charging a dumping fee. A truck driver said later that he and others used the black stuff in their home gardens. By October several thousand shipments were illegally dumped at the landfill in north St. Louis County, in violation of federal standards; they contained an estimated 43,000 tons of radioactive uranium processing wastes and contaminated soil."

Robert Alvarez, "[West Lake story: An underground fire, radioactive waste, and governmental failure](#)," *Bulletin of the Atomic Scientists*, February 11, 2016

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May 3, 2010

Mary Beth Burandt, NEPA Document Manager
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Re: Draft Tank Closure and Waste Management Environmental
Impact Statement Comments

Dear Ms. Burandt,

Hanford Challenge and the Natural Resources Defense Council (NRDC) hereby submit our joint comments regarding the Department's Tank Closure and Waste Management Draft Environmental Impact Statement.

Hanford Challenge is a membership-based, regional public interest organization based in Washington State. Our mission is to help create a future for Hanford that secures human health and safety, advances accountability, and promotes a sustainable environmental and economic legacy for Northwest communities.

NRDC is a national non-profit membership environmental organization with offices in Washington, D.C., New York City, San Francisco, Chicago, Los Angeles and Beijing. NRDC has a nationwide membership of over one million combined members and activists. NRDC's activities include maintaining and enhancing environmental quality and monitoring federal agency actions to ensure that federal statutes enacted to protect human health and the environment are fully and properly implemented. Since its inception in 1970, NRDC has sought to improve the environmental, health, and safety conditions at the nuclear facilities

Hanford Challenge and NRDC Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site

operated by DOE and the civil nuclear facilities licensed by the NRC and their predecessor agencies.

Our vision for the Hanford Site is that the environs around it are safe and accessible for all potential uses, without restriction. In particular, any environmental remediation project at Hanford should:

- Protect the Columbia River over the long term, which means effectively addressing groundwater and soil contamination
- Not rely on institutional barriers or take any credit for human control beyond 100 years after the completion of the cleanup
- Protect human health and the environment, including workers, future residents, consumers of agricultural products, recreational and commercial river users, and tribal peoples
- Honor tribal rights and treaties
- Retrieve, treat and secure any contamination that poses significant risks to the ecology and current and future generations.

These comments were prepared by Tom Carpenter, Executive Director of Hanford Challenge, Geoffrey Fettus, Senior Project Attorney at NRDC, and expert technical comments were provided by two reviewers:

1. Marco Kaltofen, PE, (Civil, Mass.)
Boston Chemical Data Corp.
Natick, MA (Attachment 1)
2. John Brodeur, PE, LEG
Energy Sciences & Engineering
Kennewick, WA (Attachment 2)

Executive Summary of Comments

Generally:

- 1) The DOE should revise and reissue the draft EIS and not move forward with a final EIS until such time as a complete site characterization is conducted and after valid risk assessment models are developed.
- 2) The Draft EIS must conform to existing federal law and it must conform to lawfully rendered agreements. Metrics which do not meet the lawfulness test or do not carry the force of regulations fail to meet NEPA

standards. One such example is the use of future areal extent of groundwater above standards, as opposed to a metric which does carry the force of law, such as future human health risk to individuals or populations. Metrics for the NEPA alternatives selection must meet all established and lawful standards such as cancer and non-cancer risks to individual resource users, environmental risks, species level risks, and adverse impacts to Native American Indian cultural resources.

- 3) The existing failures to meet completeness standards for significant portions of the draft proposed EIS nevertheless are likely to legally preclude final approval of a comprehensive EIS. The failure to address groundwater in the saturated zone is an obvious weakness of the draft proposed EIS. This level of omission has not survived scrutiny in other formerly used defense facilities which have completed their respective EIS processes. Likewise, the failure to identify or even screen for preferential underground pathways for groundwater transport is another glaring omission, which has a significant bearing on the risk numbers generated by this drafting process.

These omissions are so significant that severability of the various milestones on the road to creating a complete, comprehensive, and lawful EIS is essential.

- 4) Rather than use single scalar averages to represent all portions of the entire site uniformly, the Draft EIS should use of ranges of values or at least statistically significant values matched to actual site conditions. The current Draft EIS assumes that no preferential pathways exist in the subsurface, and that the site is perfectly homogeneous and well-characterized. Such conditions barely exist in the simple laboratory simulations, and never exist in any real-world systems. There can be no confidence in risk estimates that are based upon average values that imply homogeneity throughout the site. The use of such values fails to meet the standard of engineering practice demanded by the regulations upon which the EIS process is based.
- 5) The Draft EIS should conform to CERCLA and for Washington State's Model Toxic Control Act¹ requirements for protecting human health. Lifetime cancer risks, under those laws should not exceed 1×10^{-5} , applicable under MTCA when multiple carcinogens are considered.

¹ Washington Administrative Code (WAC) 173-340-200)

Offsite Wastes

- 6) Alternatives in the Draft EIS which include off site waste acceptance should be severed from this EIS process in order to maintain consistency with existing federal regulations. The acceptance of offsite wastes is neither required to proceed with any of the remaining Alternatives described in the EIS, nor does it further any of the NEPA required actions at the Hanford Facility, such as limitation of adverse environmental affects, prevention of negative alterations of short or long term land-uses, or the prevention of adverse outcomes from the irretrievable commitments of cleanup resources.

The DOE is poised to spend tens of billions of tax dollars on one of the most complex and challenging remediation campaigns ever undertaken. Importing and disposing of offsite waste that will in fact add new contamination to the groundwater and violate drinking water standards for thousands of years is indefensible, and defeats the purpose of the remediation effort.

High-Level Waste Tanks

- 7) Hanford Challenge and NRDC support Oregon's Proposed Alternative 7 identified in its preliminary comments to the Department of Energy in a letter dated January 5, 2010. However, we believe that all the tank waste should be removed from the tanks, adequate characterization be performed to determine whether certain tanks need to be removed, and leaked waste that has leaked from the tanks into surrounding soils be retrieved and treated.
- 8) Per the above comments, additional clarity is needed in the Draft EIS on the long term environmental and public health impacts of leaving at least 1 percent of the HLW in place in the heel of the tanks.
- 9) Also, we write to clarify some areas of altered statutory requirements. Specifically, DOE should be aware that neither *NRDC v. Abraham*, 271 F.Supp. 2d 1260 (D.Idaho 2003) nor *NRDC v. Abraham*, 388 F.3d 701 (9th Cir. 2004) collectively, the "HLW Decisions," bar DOE from removing high-level radioactive waste (HLW) from the tanks and

- treating that waste for disposal. Nor do the HLW decisions bar DOE from separating some portion of that waste into a stream that meets low-level radioactive waste (LLW) standards and disposing of that waste outside of a geologic repository in a properly licensed disposal site. Section 3116 of the 2005 National Defense Authorization Act, DOE's response to the original Idaho Federal District Court HLW Decision was a significant change to the entire structure and purpose of the Nuclear Waste Policy Act (NWPA), not a "clarification." That law has application in South Carolina and Idaho. Section 3116 does not have application in Washington or Oregon. See, Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005, Pub. L. No. 108-375, § 3116, 118 Stat. 1811, 2162-64 (2004).
- 10) The "waste incidental to reprocessing" concept codified in Section 3116 does not set cleanup standards of "99 percent," "most of the radioactivity," or an "inch and half of waste at the bottom of the tank." In fact, it sets no cleanup standard whatsoever and leaves the matter of how much radioactive waste to leave behind entirely up to the DOE. DOE should ensure that this concept is left out of its consideration of final and preferred alternatives for the Hanford Draft EIS.
 - 11) Under the current NWPA, the Environmental Protection Agency (EPA) and the Nuclear Regulatory Commission (NRC) regulate the geologic disposal of HLW – and decide what is (and what is not) HLW. At the Hanford Reservation, DOE may not unilaterally decide that HLW has been transformed into "waste incidental to reprocessing." If the concepts embodied in Section 3116 are in any way adopted or used in the Hanford Draft EIS, then EPA, NRC and the states will not have meaningful oversight over the amount of radioactive waste DOE decides to leave in the tanks.
 - 12) NRDC and literally dozens of environmental and public interest groups stood with Washington, Oregon, New York, and New Mexico and objected to the concepts embodied in Section 3116. Only the states of South Carolina and Idaho – who sided with the other states as recently as March 2004 in objecting to DOE's assertion of "waste incidental to reprocessing" authority – submitted to DOE's cleanup budget-threatening tactics and supported the legislative change. Via Section 3116, DOE obtained an exemption from the NWPA and the ability to reclassify HLW as "incidental waste" without any

congressional or state oversight. No such similar path forward exists at the Hanford site.

- 13) Clean closure of the tanks is the preferred alternative. The Draft EIS should be revised to include alternatives for Double Shell Tank closure. The Draft EIS does not consider and evaluate a true clean closure scenario that includes cleanup of the groundwater, deep vadose zone contamination and groundwater contamination from past practice facilities. Instead, all of the Alternatives fail to meet regulatory compliance standards for groundwater contamination at some point. If alternatives are presented and analyzed in the Draft EIS that fail to meet regulatory standards, that should be identified, discussed and explained in the Draft EIS. All Alternatives should be compared to a true clean closure alternative. Alternative 6(b) is the closest acceptable alternative presented.
- 14) DOE should adopt an interim policy that the farms will be clean-closed. Tank farm closure decisions can be revisited and made final after completing a more comprehensive characterization of the groundwater and vadose zone in order to understand the basic characteristics of the contamination migration processes.
- 15) No action should be undertaken by DOE that would serve to preclude clean closure of the tanks, including grouting of tanks.
- 16) All tank waste should be immobilized through vitrification. None of this waste should be disposed of on the Hanford Site, however. Adequate provision for temporary storage should be made at Hanford until a deep geological repository becomes available for use. Hanford Challenge opposes bulk vitrification and stone-casting. We support Option 2B for two high-level waste and six low activity waste melters.
- 17) Safety and worker protection should be paramount considerations in the tank farm closure and vitrification processes.

Groundwater and Vadose Zone

- 18) The Draft EIS also does not include or consider decisions about groundwater remediation at the tank farms. Instead, all of the Alternatives create groundwater sacrifice zones by default because all

Alternatives fail to meet regulatory compliance standards for groundwater. Long-term groundwater impacts would result in extensive regions of contamination along the Columbia River shoreline making the area uninhabitable. Yet the Draft EIS states that groundwater decisions are not a part of this Draft EIS. The DOE cannot say that they are going to clean up the tank farms by sacrificing the groundwater, and then claim that decisions about groundwater cleanup are not part of the Draft EIS. Clearly the Draft EIS must include consideration of groundwater cleanup decisions.

- 19) There should be no grouting and “closure” of the tanks with amounts of HLW in place, as DOE would be unable to remove any additional waste from the tanks or further maintain the integrity of the tanks. While DOE can be expected to environmentally monitor the tank fields as long as DOE has custodial responsibility over the sites, it is not contemplated that the tanks would be monitored for any specified period of time beyond that and passive institutional controls will need to be in place. Currently, we are unaware of any requirement for markers to alert future generations to the hazards posed by the waste similar to the requirements for passive institutional controls at geologic disposal site(s) for high-level radioactive waste. Such a situation would be the equivalent of abandoning waste in place. The prevailing attitude of the scientific community also uses the term “abandon.” The National Academies had this to say on the performance of grout in binding radioactive waste:

Predicting performance in resisting water infiltration can be difficult because of uncertainties that include the degree to which the first layers of grout take up the residue, the water pathway effects of the cold joints between successive pours of grout, and the effects of preferential corrosion of the tank metal and penetrating structures (thereby offering a partial bypass path). Moreover, waste tank residue is likely to be highly radioactive and not taken up in the grout, so there is substantial uncertainty associated with the volumetric classification and average concentration of the waste

and prediction of the isolation performance of the system.²

- 20) A comprehensive workplan for achieving the legally mandated levels of groundwater restoration must be included among the alternatives in the draft final EIS. In effect, this draft EIS contains only a "No Action Alternative" for contaminated groundwater at Hanford.
- 21) The invalidity of the vadose zone model is demonstrated by the fact that there is a complete misunderstanding of the source of the contamination plume that was used in the attempt to calibrate the vadose zone model. Vadose zone modeling is not properly calibrated and is inappropriate for assessing risk from contaminant migration through the vadose zone.
- 22) There is inadequate characterization of the nature and extent of the vadose zone contamination. None of the larger vadose zone contamination plumes at the tank farms have been adequately characterized to the extent that they can be used to perform the type of model validation that is needed for the risk assessments.
- 23) When some of the massive past releases occurred, soils were at near-saturation conditions, causing downward flow along preferential drainage pathways to the groundwater. This type of contaminant migration is common at most of the Hanford tank farms as indicated by patterns of contamination distribution and as is found in the similar geologic conditions in the lower Columbia Basin. With these conditions, it is inappropriate to use the type of vadose zone contamination migration model that was used in the Draft EIS.
- 24) The first step to completing a valid risk assessment is to characterize the nature and extent of contamination in the soil around the tank farms. This means tracing the contamination from the source through the unsaturated zone soil and into groundwater at most of the contamination plumes. Currently active sources of groundwater contamination are not included in the risk models. Active sources of

² National Research Council, Commission on Geosciences, Environment, and Resources. Board on Radioactive Waste Management, Committee on the Remediation of Buried and Tank Wastes, Long-Term Institutional Management of U.S. Department of Energy Legacy Waste Sites. Washington, DC: National Academy Press. 2000, p. 40.

vadose zone contamination are also not included in the risk models. It is premature to make tank closure decisions and create groundwater sacrifice zones until the subsurface conditions are understood and vadose zone plumes are adequately characterized.

- 25) The Draft EIS should also evaluate a large scale soil excavation/removal strategy for deep contamination removal.
- 26) The DOE uses full clean closure costs but only partial clean closure benefits in its cost benefit analysis.
- 27) Technitium-99 contamination related to the BY Cribs (Figure N-5 in the Draft EIS) shows an increasing trend from about 500 pCi/L to 20,000 pCi/L and rising from about 1983 to the present. This trend indicates a dynamic groundwater contamination condition, not a steady state flow as modeled, and it indicates that an active vadose zone plume is just now entering the groundwater in the immediate vicinity of the well.
- 28) DOE should not plan to undertake any remediation that requires institutional controls beyond 10 years after closure. The Draft EIS appears to assume that the DOE, or another agency of the US government, will control the Hanford Site for 10,000 years (vol 2., p. Q-31). This is an extremely unlikely scenario, and defies common sense.

Detailed comments from Marco Kaltofen, PE, (Civil, Mass.), Boston Chemical Data Corporation, and John Brodeur, PE, LEG, are attached to this letter and should be incorporated in full as part of these comments.

In addition to the attached expert comments, we also offer the following detailed comments:

- 29) The Draft EIS alternatives should be amended to identify mitigation to protect the soil, groundwater, environment and future generations.
- 30) Please identify how Quality Assurance/Quality Control (QA/QC) procedures and protocols were used in the performance of the draft TC&WM EIS analysis.
- 31) p. 24, Vol. 1, 1.7.1: Retrieval should be governed by more than the 99 percent volumetric goal. After the 99 percent volumetric retrieval, if

- specific radionuclides remain that pose unacceptable health or environmental hazards, then they should be targeted and more retrieval should be required until their health and environmental hazards are at or below acceptable level.
- 32) p. 24, Vol 1: “Using currently available liquid-based waste retrieval and leak detection systems, waste would be retrieved” may be problematic. No retrieval method should unduly increase the amount of contaminants that leak into the surrounding soil. Sluicing tanks that are known to be leakers is not an acceptable option, unless it can be clearly demonstrated that future leaks will not occur. The leak detection systems must be accurate and the retrieval process must be highly regulated to ensure that the retrieval process will be stopped before any significant leaks can occur.
- 33) p. 24, Vol1: “For analysis purposes, it was assumed that the WTP would need to be replaced after 60 years” means that DOE must guarantee that the replacement will occur, else the analysis is meaningless.
- 34) p. 24, Vol1: “filled with grout to immobilize the residual waste” is inaccurate. The grout may serve to reduce the mobility of the residual waste contaminants, but it will not completely “immobilize” them.
- 35) p.27, Vol1: “closed as an RCRA hazardous waste landfill unit under WAC 173-303, “Dangerous Waste Regulations,” and DOE Order 435.1, as applicable,” Remove “as applicable” because both requirements do apply.
- 36) p.27, Vol1: “The BX and SX tank farms would be clean-closed by removing the tanks, ancillary equipment, and soils to a depth of 3 meters (10 feet) below the tank base.” The selection of 10 feet must be addressed here (based on contaminant concentrations and costs) and must be justified elsewhere. “Where necessary, deep soil excavation would also be conducted to remove contamination plumes within the soil column.” “Where necessary” needs to be replaced by specific requirements or at least a reference to a section where the specific requirements are located.

- 37) p.27, Vol1: “The MLLW would be disposed of on site.” The proposed location for future disposal must be identified and analyzed, else DOE may only be transferring a problem from one location to another.
- 38) p.27, Vol1: “Using currently available liquid-based retrieval and leak detection systems, waste would be retrieved to a volume corresponding to 90 percent retrieval, less than the TPA Milestone M-45-00 minimum goal of 99 percent.” DOE agreed to the TPA Milestones, thus there is no need to analyze or present an alternative that would violate DOE's legally-binding commitments.
- 39) p.29, Vol. 1: “The HLW debris from clean closure would be managed as HLW and stored on site.” Debris needs to be defined. Hanford Challenge supports the DOE’s proposal to characterize the melters as HLW, and disposed of according to the requirements in the Nuclear Waste Policy Act.
- 40) p.29, Vol. 1, Tank Closure Alternative 6C: While the soil cleanup is to a deeper level than for other alternatives, cleanup may be needed at even greater depths. Also, for this alternative and all others, plans for cleanup of soil that is not directly under tanks must be included.
- 41) Vol. 2, p541, D.1.1 (D-2): “All radionuclides are decayed to January 1, 2001 (DOE 2003a).” It is unclear whether ingrowth of progeny is properly considered, which can be of vital importance. If ingrowth was not considered, please do so and make the appropriate corrections.
- 42) Vol. 2, p542, D.1.1 (D-3): “For the groundwater release screening scenario, only drinking water consumption was considered.” If screening is not performed for all groundwater pathways, key contaminants may be screened out that should not be. Either provide evidence that the limited screening is bounding or extend the screening to all groundwater pathways that are analyzed.
- 43) Vol. 2, p542: “Radionuclides contributing less than 1 percent of impacts” is unclear. Was the total contribution from the screened out contaminants less than 1 percent or was the contribution from each individual radionuclide less than 1 percent? If the latter case is true, then it is possible that slightly less than 36 percent of the impacts were ignored. Please clarify the statement and ensure that the former case is what was adopted. Please provide details on how the screening analyses

were performed, whether the same computer programs and models were used as in the final analysis or if surrogates were utilized.

- Also, it is unclear whether daughter ingrowth was considered in the screening analyses. Please state exactly what was analyzed. If progeny ingrowth was not considered, then the screening analyses must be corrected.
- Please state how uncertainty was included in the screening analysis. If uncertainty was ignored, then the screening could easily miss important contaminants. If uncertainty was not included, then the analysis needs to be corrected.
- Please provide a complete list of the expected inventories for all contaminants before the screening process was performed and what their impacts were.
- Inventories of all organics that could complex with contaminants and affect their mobility are required.

44) Vol. 2, p2231, Q.2.4.2 (Q-25): “Physical characteristics of soil were based on site-specific measurements, description of the soil as silty clay loam (Mann et al. 2001)” Please provide a complete set of soil physical properties, rather than relying on a single description. Hundreds of soil measurements have been performed over decades and clay has almost always only been detected in very minute quantities. Much better support is required before such an important analysis can rely on a single statement from an author that is not a geologist. Any covers have conceptually been considered to be impregnated silt overlying sand, gravel and basalt.

- a. If impregnated silt is considered, then rock corrections are needed for porosities and other physical properties.

45) Table Q-7. No evidence of rock corrections is evident. Please make the appropriate corrections here and throughout all the physical property data and analyses.

46) Tables Q-7 to Q-8. Properties such as the hydraulic gradient, dry bulk density and vadose zone thickness will vary across the site. Also the use of a single strata would cause any bona fide geologist to go into

shock. Unless it can be demonstrated that the current analysis is bounding, individual analyses for each tank farm is needed.

47) Table Q-12 contains the following contaminants:

Hydrogen-3 (tritium)
Carbon-14
Potassium-40
Strontium-90
Zirconium-93
Technetium-99
Iodine-129
Cesium-137
Gadolinium-152
Thorium-232
Uranium-238
Neptunium-237
Plutonium-239
Americium-241

Table D-2 contains the following radionuclide:

Hydrogen-3 (tritium)
Carbon-14
Strontium-90
Technetium-99
Iodine-129
Cesium-137
Uranium isotopes
Neptunium- 237
Plutonium isotopes
Americium- 241a

It is clear that there is a disconnect between these tables. Also, it appears that ingrowth of progeny has not been considered which invalidates the analyses.

- 48) E.1.2.2.5 Leak Detection and Monitoring – Acceptable leak volumes need to be defined. Those definitions need to be developed based on contaminant concentrations and distributions from past leaks and spills and residual concentrations. Modeling should be able to predict risks from potential future leaks and those risks must be within acceptable levels.
- 49) p. 710, Vol. 2, E.1.2.2.53 (E-29): “However, given the limited sensitivity of some SST leak detection systems, larger leak volumes could occur.” Maximum allowable leak volumes must be defined and leak detection systems must be demonstrated that will ensure that leaks greater than the maximum allowable cannot occur.
- 50) p. 1734, Vol. 2, L.1.3 (L-3) - “The Technical Guidance Document specifies five key requirements for development of the TC & WM EIS groundwater flow field, as follows:
- a. The flow field should be transient (i.e., change with time).
 - b. The factor driving the transient behavior should be operational recharge to the aquifer rather than time-changing boundary conditions.
 - c. The sitewide natural recharge rate should be 3.5 millimeters (0.14 inches) per year.
 - d. Both a Base Case and a Sensitivity (Alternate) Case should be investigated; the difference between the two cases should take into account the uncertainty in the top of basalt (TOB) elevation in the Gable Mountain–Gable Butte Gap (Gable Gap). The intent of the TC & WM EIS is to illustrate any potential differential effects this uncertainty might have on simulated alternative impacts. This approach was preferred (as opposed to presentation of results for all alternatives for each flow field) for brevity and clarity of presentation.
 - e. Flow field development should be consistent with the frameworks for vadose zone and contaminant transport modeling.

- f. Even if DOE provides an edict on the natural recharge rate, scientific justification is still required to use that value, else the analysis is useless.
- 51) p. 1742, Vol. 2, L-11, L.4.2: “The only time-varying fluxes of water across the model boundary are anthropogenic recharges.” The above statement is known to misrepresent field conditions. A detailed discussion of the misrepresentations is needed including an analysis of their effects. Examples of misrepresentations are that the river elevations change over time, leakage occurs through the basalt, and areas modified by man do not receive the natural recharge (e.g., buildings, roads, etc.).
- 52) p.1745, Vol.2, L.4.2 (L-11): “tank farms receive 100 millimeters (4 inches) per year.” Because all cell footprints are 200 m X 200 m, a discussion of boundary conditions over cells only partially containing tank farm or other unnatural entities is needed.
- 53) “p.1745, Vol.2, L.4.2.4 (L-14): Values for over 200 sources (or sinks) of water were taken from the Cumulative Impacts Inventory Database (SAIC 2006) and encoded into the model.” Information on which sources were selected and any rejections is needed to help check the model. Also comments from the LUG and experts are needed with the accepted resolutions.
- 54) p.1757, Vol 2, L.5.1.1 (L-26): “To mitigate the rewetting problem in the Gable Gap area within the model, inactive cells that represented the TOB were made active and assigned hydraulic conductivity values that are more than 500 times smaller than that of Hanford and Ringold Muds (0.001 meters [0.00328 feet] per day). Making the inactive cell active and using a low hydraulic conductivity value allowed the active water table cells above the TOB to rewet from below but also maintained the TOB as an impermeable boundary.”
- a. The DOE’s claim to have an impermeable boundary of active cells with a non-zero conductivity is not possible. Also, a computer program that does not allow rewetting from any adjacent cell cannot represent physical reality, thus any analyses using such a computer program for Hanford sediments cannot duplicate certain physical processes and its results are suspect. Results

from representative test cases must be benchmarked against computer program that can duplicate those physical processes to estimate the amount of error that is introduced by applying the computer program with known errors.

- 55) p. 1758, Vol 2, L.5.4 (L-27): “Pre-Hanford head observation data are not available.” The TC & WM EIS groundwater flow model was assigned an initial arbitrarily high water table and run in transient mode for 500 years to simulate pre Hanford (1940–1943) conditions with only natural recharges applied per the Technical Guidance Document (DOE 2005). This initial 500-year model run approached long-term steady state conditions, which is assumed to represent pre-Hanford conditions.” Residents lived at the Hanford location, probably farming. Their effect on the environment must be included when establishing initial conditions.
- 56) p. 1758, Vol 2, L.6.1 (L-27): “Closer than 600 meters (1,969 feet) to the Columbia River, to remove the periodic fluctuations in the river stage from the head observation data” The periodic fluctuations in the river stage may be one of the most important factors affecting the transport of contaminants into the Columbia River, yet it is being rejected. At a minimum, separate analysis is needed to determine its importance and how to include that importance.
- 57) N.1.2; “Boundary conditions for the upper surface at each site are a specified recharge determined by technical guidance (DOE 2005)” For the saturated zone model, the recharge was altered annually based on human activities. The same rule applies to the vadose zone analysis, although the timing should be more refined.
- 58) N1.2; “More than 400 subarea models are required” for the vadose zone analyses. The edges of the subarea models were extended to the point where the side contaminant fluxes were set to zero. This approach requires that there is no interaction between the subarea models.
- a. Please provide a single figure showing the footprints of all subarea models and state that there is no interaction between any subarea models.
 - b. Other: The tank T106 leak (and possibly others) was so great that it altered the vadose zone. A typical release to the vadose zone

model is not applicable and is not acceptable for such leaks. One example of the vadose zone alteration is that Cesium traveled so far, because so much Sodium (Na) flooded the vadose zone that it tended to occupy the sorption sites where the Cs typically would occupy.

- 59) p. 1933, Vol. 2, N.1.2 (N-3): “In summary, the process for the selection of hydraulic parameter values involved the matching of predicted to measured borehole moisture content profiles for all 16 soil types followed by the matching of randomly generated soil types to observed unconfined aquifer conditions for 3 primary soil types. It also provided for consistency with values of saturated hydraulic conductivity” Quantification of the random generation process is needed and numerical values for determining consistency are required, because as stated the values may not even be realistic, but could match what is stated.
- a. Other: Using 200 m X 200 m cells throughout the model domain will result in excessive smearing and likely numerical dispersion for contaminant transport analyses. What was done to address these concerns?
- 60) p.1937, Vol. 2, N.1.2 (N-7): “The early peak of the predicted technetium-99 profile occurs at the same time as the early peak of the measured total beta profile (see Figure N-5) but is lower because of the presence of radionuclides other than technetium-99 among beta emitters. The concentration level measured and predicted for technetium-99 for the current time period are in general agreement. Thus, the predicted concentration profile for technetium-99 shows qualitative agreement with the reported concentration of gross-beta activity.”
- a. The above interpretation is highly suspect. First, information for Figures N-5 and N-6 are plotted separately making any interpretation difficult. Second, the time axes are entirely different, making any interpretation even more difficult. While the early peak Tc-99 concentration (~1E6) may be lower than the total beta peak concentration (~1E9), it is 3 orders of magnitude lower, while at later times, the measured values for Tc-99 actually exceed the measured value for total beta. Additionally, the latest measured values for both Tc-99 and total beta are trending upwards, while the

predicted value are essentially constant. There is no general agreement here. Because the Tc-99 measurements are greater than the total beta measurements, some measurements are clearly in error. The measurement errors need to be addressed.

- 61) p.1938, Vol. 2, N.1.2 (N-8): “Estimates of isopleths of concentration of technetium-99 near the BY Cribs based on measurements reported for 2007 are presented in Figure N–7. These data were used to provide additional testing of the proposed set of values of vadose zone hydraulic parameters. The approach used TC & WM EIS source data for the BY Cribs, the STOMP vadose zone model, the MODFLOW-predicted transient flow field, and a particle tracking transport model to predict spatial distribution of technetium-99 in the unconfined aquifer for calendar year 2005. The results of this analysis are presented in Figure N–8.” There is no reason why model results could not be presented for year 2007 to allow direct comparison with measured results.
- a. The color scheme and inclusion of the mesh in Figure N-8 makes even trying to read the figure almost impossible. The two figures should be combined using simple contours, but different colors for measured vs. predicted values, with a zoom-in figure if needed.
 - b. Other: No mention of Courant numbers or Peclet numbers, common modeling metrics, could be found in Vol 2, calling into question the accuracy of any and all results.
- 62) p.1938, Vol. 2, N.1.2 (N-8): “The predicted concentrations show both qualitative and quantitative agreement with measured concentrations, with high levels near the sources and decreasing levels in the northwest direction. The predicted concentrations also show movement to the southeast due to transient flow in that direction under the influence of high aqueous discharges from past Hanford operations.”
- a. The “quantitative agreement” is questionable. Even 1D models would show higher levels near the sources. For quantitative agreement, a metric must first be established, such as a root-mean-square approach (as was used for the saturated zone well heads) where differences between predicted concentrations at well locations are compared to measured concentrations at the same wells. Next, an acceptable level for differences must be

established. Differences must be calculated for all the times when measurements were recorded for each subarea model. In that manner quantitative measures can be established for each subarea and can be compared against a pre-specified standard.

- b. Merely providing graphical results for a very small sample of subarea models is of limited value. It does not allow anybody to draw any meaningful conclusions, if for no other reason than the sample may not be representative. The preponderance of the evidence should demonstrate the accuracy and usefulness of the models.
- c. Some more meaningful examples would be:
 - i. compare model predictions with actual contaminant discharges to the Columbia River for a total system evaluation
 - ii. compare model predictions with actual contaminant movement from the T-106 tank leak for a near-field release that has been well studied and documented
 - iii. compare with pump-and-treat operations that combines the effects of large scale and long term contaminant migrations with the efficacy of human intervention with its implications on the various proposed alternatives

63) p.1941, Vol. 2, N.1.2 (N-11): “On the basis of this quantitative agreement of a factor of less than five quantitative agreements...” This makes no sense. Presentation of results over an extended period of time would be much more valuable and would provide much more information than a single snapshot in time

64) Figure N-9: please explain “Tritium picocuries per cubic liter”

65) Figure N-12: It appears that a considerable amount of numerical dispersion has infected the model, producing more widespread pollution than is real and lowering peak concentrations. A simple contour plot (without contour flooding) overlaying wells with zero or < 100 pCi/L of H-3 is needed to address this issue and help evaluate the accuracy of the modeling predictions.

66) Table N-1: “Plio-Pleistocene Cement” needs explanation. It does not appear that any rock (gravel) corrections have been included in this table. Please explain why not and provide justification.

- 67) Table N-1: No mention of horizontal hydraulic conductivity or anisotropy is provided. Please provide the missing information and its justification.
- 68) Table N-1: Please explain why the Hanford gravel has a hydraulic conductivity (0.0125 cm/s) that is less than that for Hanford sand (0.0202 cm/s). Those values do not agree with the basic material definitions and can lead to extremely erroneous model predictions.
- 69) Please identify how Quality Assurance/Quality Control (QA/QC) procedures and protocols were used in the performance of the draft TC&WM EIS analysis.
- 70) As noted by the Hanford Advisory Board's independent contractor's analysis, there are a number of unit conversion or data errors that raise serious doubts about the quality of the analysis.

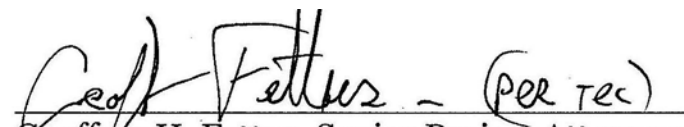
Conclusion

We request that you withdraw this draft TC&WM EIS, and revise it to provide legally-compliant alternatives. We look forward to the DOE's response to our comments.

Sincerely yours,



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**Comments on the Draft Tank Closure and Waste Management
Environmental Impact Statement for the Hanford Site, Richland, WA,
USDOE, Oct. 2009**

Prepared for

Hanford Challenge

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Executive Summary

1) The EIS must conform with existing federal law and it must conform with lawfully rendered agreements. These laws and agreements include:

- The Hanford Federal Facility Agreement and Consent Order, also called the Tri Party Agreement.
- The Nuclear Waste Policy Act, which requires the permanent isolation of specific waste streams at the Hanford Site.
- The Native American Graves Protection and Repatriation Act of 1990, 43 CFR 10.
- NEPA, the National Environmental Policy Act. By this statute, (Section 102(2)(C) NEPA), the actions proposed in an EIS should be protective of the environment and human health. The EIS must address the environmental impact of the proposed action, adverse environmental effects under an implemented proposal, alternatives to the proposed action, the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.
- Washington State, Model Toxics Control Act Statute and Regulation - Chapter 70.105D RCW, Uniform Environmental Covenants Act Chapter 64.70 RCW, and MTCA Cleanup Regulation Chapter 173-340 WAC
- Resource Conservation and Recovery Act
- Comprehensive Environmental Response, Compensation, and Liability Act, (CERCLA or more commonly, Superfund)

2) The major decisions to be made, as described in this EIS, (storage of tank waste, percent retrieval of tank waste, tank waste treatment, treated tank waste disposal, SST closure, creation of facilities to accept and treat offsite waste, and FFTF decommissioning), should be treated as severable matters. Waste Treatment Plant (WTP) closure, DST closure, groundwater remediation, CERCLA past practice units, and FFTF deactivation have already been severed from this EIS. Likewise, portions of the EIS found to meet applicable laws and agreements should go forward, even if an independent and individual major decision outlined above can not meet the standard of lawfulness.

The existing failures to meet completeness and lawfulness standards for significant portions of the draft proposed EIS nevertheless are highly likely to legally preclude final approval of a comprehensive EIS. The failure to address groundwater in the saturated zone is an obvious weakness of the draft proposed EIS. This level of omission has not survived scrutiny in other formerly used defense facilities which have completed their respective EIS processes. Likewise, the failure to identify or even screen for preferential underground pathways for groundwater transport is another glaring omission, which has a significant bearing on the risk numbers generated by this drafting process.

These omissions are so significant that severability of the various milestones on the road to creating a complete, comprehensive, and lawful EIS is essential. Without this, the redrafting/reapproval process will become so drawn out that it will become impossible to meet the existing agreements between the many agencies which are responsible for the Hanford cleanup.

3) A comprehensive workplan for achieving the legally mandated levels of groundwater restoration must be included among the alternatives in the draft

final EIS. In effect, this draft EIS contains only a "*No Action Alternative*" for contaminated groundwater at Hanford.

4) The State of Oregon and the State of Washington have produced official statements regarding the acceptance of specific alternatives in the EIS. These important stakeholders support minimum 99 percent tank waste removal, off site storage of high levels wastes in a deep geological repository, pretreatment of tank or low activity wastes, and avoidance of "supplemental" treatment technologies. Hanford Challenge generally supports these two State-sponsored proposals, and is opposed to alternatives in the EIS which do not meet the requirements of the States of Washington and Oregon and the Tri Party Agreement.

Hanford Challenge supports Oregon's Proposed Alternative 7 identified in its preliminary comments to the Department of Energy in a letter dated January 5, 2010. Hanford Challenge, however, believes that all the tank waste should be removed from the tanks, and adequate characterization be performed to determine whether tanks be removed and leaked tank waste retrieved and treated from beneath the tanks. Hanford Challenge does not support categorically treating all soil overburden as high level waste, as this may draw resources away from important cleanup requirements. Overburden should be treated according to relevant and applicable environmental laws, legal agreements, and regulations.

5) Acceptance of offsite wastes is not related to any of the required activities described by the EIS. The acceptance of offsite wastes is a fully separate regulatory process permitted under 10 CFR 61, NUREG 1300, 40 CFR 270.11, 270.13, 270.14, and 40 CFR 264.18, 264.95, 264.97 and others. Alternatives in the EIS which include off site waste acceptance should be severed from this EIS process in order to maintain congruence with existing federal regulations. The

acceptance of offsite wastes is neither required to proceed with any of the remaining alternatives described in the EIS, nor does it further any of the NEPA required actions at the Hanford Facility, such as limitation of adverse environmental affects, prevention of negative alterations of short or long term land-uses, or the prevention of adverse outcomes from the irretrievable commitments of cleanup resources.

6) Hanford Challenge supports decontamination of the FFTF via removal and closure. The actions required to clean close this facility, while substantial, are far less daunting than upcoming tasks at Hanford, such as groundwater remediation and closure of former cribs and trenches.

7) Alternatives selected as a result of this EIS must not create a legal or technical condition which prevents or adversely affects closure of the WTP, DST closure, groundwater remediation, and closure of CERCLA past practice units.

8) Alternatives selected through this EIS process must meet all lawful and applicable regulations and standards. Metrics which do not meet the lawfulness test or do not carry the force of regulations fail to meet the NEPA standard. One such example is the use of future areal extent of groundwater above standards, as opposed to a metric which does carry the force of law, such as future human health risk to individuals or populations. Metrics for alternatives selection must meet all normal and lawful standards such cancer and noncancer risks to individual resource users, environmental risks, species level risks, and adverse impacts to Native American Indian cultural resources.

9) Alternatives were compared and site conditions modeled using a limited set of environmental constants and receptor values. Individual scalar values were

used for critical modeling constants such as soil bulk densities, soil porosities, hydraulic conductivities, particulate concentrations in air and so on. Rather than use single scalar averages to represent all portions of the entire site uniformly, the EIS should use of ranges of values or at least statistically significant values matched to actual site conditions. The current EIS assumes that no preferential pathways exist in the subsurface, and that the site is perfectly homogeneous and well-characterized. Such conditions barely exist in the simple laboratory simulations, and never exist in any real-world systems. There can be no confidence in risk estimates that are based upon average values that imply homogeneity throughout the site. The use of such values fails to meet the standard of engineering practice demanded by the regulations upon which the EIS process is based.

Review of Tank Farm Alternatives

Tank Farm Alternative 1 – No Action - The no action alternative is not considered, nor is it acceptable or lawful. Hanford Challenge does not support Tank Farm Alternative 1.

Tank Farm Alternative 2A – Existing WTP Vitrification; No Closure

This alternative does not comply with the existing Tri-Party Agreement, based upon this alternative's prolonged schedule, failure to pretreat ⁹⁹Tc waste streams, and failure to dispose of high level wastes offsite in a geological repository as required under the Nuclear Waste Policy Act, (NWPA). Hanford Challenge does not support Tank Farm Alternative 2A.

Tank Farm Alternative 2B – Expanded WTP Vitrification; Landfill Closure.

This alternative does not comply with the existing Tri-Party Agreement, based upon this alternative's failure to prevent existing contamination in the vadose zone, which is currently greater than 15 feet below ground surface, from ultimately reaching the Columbia River. This alternative requires the construction of a second vitrification plant. With this investment, the expanded vitrification for low activity waste reduces overall risks compared to alternative 2A. This alternative fails, as does alternative 2A, because of its reliance on landfill closure, which does not meet the requirements of the Tri-Party Agreement or the Nuclear Waste Policy Act. Hanford Challenge does not support Tank Farm Alternative 2B.

Tank Farm Alternative 3A, 3B, and 3C – Existing WTP Vitrification with Supplemental Treatment (3A - Bulk Vitrification, 3B – Cast Stone, and 3C – Steam Reforming); Landfill Closure. These alternatives fail to remove wastes from the tank farm, substituting inferior bulk stabilization methods for more appropriate treatment via the Vitrification plant(s). Engineering scale studies have found these measures to be less effective than removal and treatment options. These closure options are not permanent measures and thus they fail to meet the criteria of the Tri-Party Agreement and they fail to dispose of high level wastes offsite in a geological repository as required under the Nuclear Waste Policy Act, (NWPA). Leaving these wastes stored in situ at Hanford indefinitely is not a legal option. These alternatives are not supported by Hanford Challenge.

Tank Farm Alternative 4 – Existing WTP Vitrification with Supplemental Treatment Technologies; Selective Clean Closure/Landfill Closure. This alternative is not supported by the State of Oregon, which correctly notes that this alternative does not meet Tri-Party Agreement requirements for the quality of the final waste form. This alternative is not supported by Hanford Challenge. This alternative does not comply with the NWPA which requires permanent isolation of the Tank Farm wastes and any accompanying remedial wastes. Leaving these wastes stored at Hanford indefinitely is not a legal option.

Tank Farm Alternative 5 – Expanded WTP Vitrification with Supplemental Treatment Technologies; Landfill Closure. This alternative does not retrieve 99 percent or more of the tank waste. The State of Oregon correctly notes that this alternative does not meet Tri-Party Agreement requirements for the quality of the final waste form. This alternative is not supported by Hanford Challenge. This alternative does not comply with the NWPA which requires permanent isolation

of the Tank Farm wastes and any accompanying remedial wastes. Leaving these wastes stored at Hanford indefinitely is not a legal option.

Tank Farm Alternative 6A – All Vitrification/No Separations; Clean Closure.

This alternative does not meet existing scheduling requirements, primarily due to the lack of pretreatment separations. It is in other respects the same alternative as 6B. This alternative is not supported by Hanford Challenge because of its extended timetable. This option fails to meet legal requirements.

Tank Farm Alternative 6B – All Vitrification with Separations; Clean Closure.

This alternative has one distinct advantage over all of the other proposed alternatives. This alternative does not commit the US DOE to any irreversible actions or irretrievable commitments of resources to actions which violate NEPA, CERCLA, RCRA, and other legislation which enables the Hanford clean up. Other stakeholders have made detailed comments regarding additions to alternative 6B and the draft EIS generally which would enable this specific alternative to meet legal as well as State, Community, and Tribal requirements. As a single illustrative example, multiple stakeholders, (Oregon DOE, Nez Perce Tribe ERWM Program analysis, Hanford Challenge, and others), request that technecium-99 removal be included for this option.

(For explicit details on these see, Alternative 7 – the Oregon Proposal, dated January 4, 2010 by the Oregon DOE, and the Affiliated Tribes of Northwest Indians Resolution 10-02 on 99.9% removal of single-shell tank wastes).

Tank Farm Alternative 6C – All Vitrification with Separations; Landfill Closure.

This alternative fails to meet legal requirements due to the inclusion of landfill closure as the final disposal option for the single shell tank farms. This

alternative thus fails for the same reasons described for alternatives 2B, 3, 4, and 5, namely the failure to meet the standards of legal agreements and regulations. These failures are, once again, failure to be protective of the Columbia River and failure to provide for disposal in an offsite repository. This alternative is not supported by Hanford Challenge.

Review of FFTF Decommissioning Alternatives

FFTF Decommissioning Alternative 1 – No Action

The no action alternative is not considered, nor is it environmentally acceptable nor is it lawful. This alternative is also the most expensive. Keeping the FFTF in surveillance and maintenance status comes at a significant cost economically, and increases short term environmental impacts. This alternative is not supported by Hanford Challenge.

FFTF Decommissioning Alternative 2, Entombment & Alternative 3, Removal

The treatment of the RH-SCs and the disposition of bulk sodium is the same for alternatives 2 and 3. Costs are similar between alternatives 2 and 3. Hanford Challenge supports alternative 3, removal, as having the lowest long term risk.

Review of Waste Management Alternatives

Waste Management Alternative 1 – No Action. The no action alternative is not acceptable or lawful for the disposition of onsite-generated wastes in that it contradicts existing federal and state laws. No action is the preferred alternative

to the acceptance of offsite-generated wastes, given that it is not possible to accept such offsite-generated wastes and yet remain within the boundaries of existing federal regulations.

Component 1: All onsite-generated LLW and MLLW would be treated and disposed of in the existing, lined 218-W-5 LLBG trenches. Component 1 of Alternative 1 is contrary to existing laws and legal agreements, including, the Hanford Federal Facility Agreement and Consent Order, also called the Tri Party Agreement, the Nuclear Waste Policy Act, which requires the permanent isolation of specific waste streams at the Hanford Site, NEPA, the National Environmental Policy Act, Washington State's Model Toxic Waste Act, the Resource Conservation and Recovery Act and the Comprehensive Environmental Response, Compensation, and Liability Act, (CERCLA or more commonly, Superfund). Hanford Challenge does not support Component 1 of Alternative 1.

Component 2: No offsite-generated waste would be accepted. There is no environmental benefit which accrues to the Hanford facility for this option, nor is any other alternative in the EIS dependent on completion of this component, thus the lowest risk option is no action for this component of Waste Management Alternative 1. Hanford Challenge supports component 2 of Alternative 1 for waste management.

Waste Management Alternative 2

Component 1: Would continue treatment of onsite-generated LLW and MLLW in expanded, existing facilities and dispose of onsite-generated LLW and MLLW in a single IDF (IDF-East).

Component 2: Extends this alternative to include previously treated offsite-generated wastes. Component 1 of alternative 2 does not provide the mandated level of risk reduction, nor does it comply with existing state and federal regulations. Component 2 of Alternative 2 is contrary to existing laws and legal agreements, including, the Hanford Federal Facility Agreement and Consent Order, also called the Tri Party Agreement, the Nuclear Waste Policy Act, which requires the permanent isolation of specific waste streams at the Hanford Site, NEPA, the National Environmental Policy Act, Washington State's Model Toxic Waste Act, the Resource Conservation and Recovery Act and the Comprehensive Environmental Response, Compensation, and Liability Act, (CERCLA or more commonly, Superfund). Hanford Challenge does not support Components 1 and 2 of Alternative 2.

Waste Management Alternative 3

Component 1: Would continue treatment of onsite-generated LLW and MLLW in expanded, existing facilities and dispose of onsite-generated in a single IDF (IDF-East); and would continue treatment of onsite-generated LLW and MLLW in expanded, existing facilities, but would dispose of onsite-generated LLW and MLLW in two IDFs (IDF-East and IDF-West). This component provides the maximum total risk reduction for receptors, and comes closest to meeting the requirements of existing state and federal regulations. Hanford Challenge supports Component 1 of Alternative 3.

Component 2: Extends this alternative to include previously treated offsite-generated LLW and MLLW. Component 2 of Alternative 3 is contrary to existing laws and legal agreements, including, the Hanford Federal Facility Agreement and Consent Order, also called the Tri Party Agreement, the Nuclear Waste Policy

Act, which requires the permanent isolation of specific waste streams at the Hanford Site, NEPA, the National Environmental Policy Act, Washington State's Model Toxic Waste Act, the Resource Conservation and Recovery Act and the Comprehensive Environmental Response, Compensation, and Liability Act, (CERCLA or more commonly, Superfund). Hanford Challenge does not support Component 2 of Alternative 3.

The preferred waste management alternatives are Component 2 of Alternative 1 and Component 1 of Alternative 3, so long as component 1 of Alternative 3 meets all applicable and relevant state and federal regulations as presented in a final EIS.

General comments

Standing – The comments presented are offered in matters of law only, and are not meant to represent or replace a technical commentary.

Legality – A final EIS must meet all applicable and relevant state and federal regulations, and meet the requirements of legal agreements.

Any portion of a final EIS which is contrary to any laws, regulations, standards, or lawful agreements has no legal viability in any judicial authority, whether state, federal, or other United States jurisdiction.

Severability - If a portion of a final EIS is determined to be lawful and is agreed to by the signatories of existing relevant lawfully-made agreements, then this portion of the final EIS should proceed into force, without regard to nonrelevant portions of the final EIS which do not achieve this same standard of lawfulness.

Standards - The use of a, "Maximum area to exceed criteria or standards" benchmark is an unacceptable criterion for measuring remedial success. The minimizing of human health and safety and environmental risks is the more accepted precedent. All standards and criteria used in the final EIS must meet state and federal regulatory requirements for applicability and enforceability. The use of benchmarks which do not have a basis in law, precedent or regulation is not an acceptable means of proving that an alternative presents the lowest practical environmental or public health risk level.

Failure to meet standards – The presumed failure to meet river water quality, groundwater quality, (based on radionuclide concentrations), and air quality

standards, (based on particulate matter, carbon monoxide, and sulfur and nitrogen oxides), is not an acceptable foundation for a final EIS. Final approval of remedial alternatives must include a timetable and roadmap for meeting these legal obligations. In particular, the failure to meet air quality standards for particulate matter is problematic in that radionuclide transport is facilitated by particulate matter. This represents a direct pathway for increased human exposure to radioactive material.

Cultural and Paleontological Resources, (Native American Indian Interests), are described in the draft EIS as sensitive to impact from ground disturbance as well as sensitive to visual disturbances which may impact sites of cultural and religious significance. In addition the impacts on the Columbia River system and its fisheries should receive consideration in the selection of preferred alternatives. Alternatives which fail with respect to Columbia River protection also fail to respect issues of Native American Indian cultural and paleontological resource protection.

Offsite wastes – Acceptance of offsite wastes does not provide an environmental benefit to the mandated Tank Farm closure and FFTF Decommissioning programs, nor is it a requirement to complete these mandated programs. The acceptance of offsite wastes comes at the cost of increased risks to the environment and the safety and health of the public at the Hanford site. For example, from the EIS Tank Farm Summary document, p. S-109, the applicant notes that, "receipt of offsite waste streams that contain specific amounts of certain isotopes, specifically iodine-129 and technetium-99, could have an adverse impact on the environment." Alternatives which include the acceptance of offsite wastes should be excluded categorically from the final EIS.

Completeness – No comprehensive evaluation of current groundwater

conditions, baseline risks, or potential remedial/restoration measures is included in the draft EIS. This omission by itself threatens the integrity of the entire EIS process and the accompanying restoration schedule.

Insufficient risk/exposure model verification and calibration - Alternatives were compared using a very limited set of environmental constants and receptor values. Individual set values were used for critical modeling constants such as soil bulk densities, soil porosities, hydraulic conductivities, particulate concentrations in air and so on. (See EIS-0391 V2 p. Q-26)

Individual values appear to be selected to minimize apparent exposure risks, such as the use of 4.5 microgram per cubic meter PM₁₀ as the only reference value for exposure to dusts. This value is 1/5th the value for US urban sites, and less than 1/15th the values for high dust events in the Pacific Northwest. (M. S. Wolff et al, EHP, 2005;113(6):739-748, and Center for Air Pollution Impact and Trend Analysis, R. B. Husar et al, 1998 respectively). The prevalence of high dust events in the region is well documented. A handful of days at the elevated dust storm levels would raise the Time Weighted Annual Ambient Average PM₁₀ levels to concentrations far above the 4.5 EE-6 g/cubic meter used to evaluate risk in the EIS.

The use of these values also implies a level of environmental homogeneity which does not exist in the real world. For subsurface pathways, for example, preferential pathways are known to exist at various parts of the site. These preferential pathways may cause ground water hydraulic conductivities to increase by orders of magnitude compared to surrounding strata. Likewise, these preferential pathways can cause breakthrough times for radioactive wastes to reach the Columbia River to drop by orders of magnitude.

End note

The nuclear engineering profession has understood from the outset that the Columbia River and the Pacific Ocean itself must be protected from radioactive contamination. Actions at Hanford are sometimes evaluated through the false perspective that its original operators were unaware of the potential damage that radiation does in the environment.

A prominent 1954 text on reactor design notes that, "The danger that is always present is that sea plants and animals that utilize minerals from water will concentrate the active material in their bodies, and the radioactivity may ultimately reappear in sea food consumed by human beings." (From, Introduction to Nuclear Engineering, Raymond L. Murray, 1954, Ch. 15 Radioactive Waste Disposal, p. 300, Prentice Hall Publishers). This author was a student of Robert Oppenheimer and was a research assistant to Ernest Lawrence. Fifty six years later, protection of the Columbia remains the underlying principle of the laws that regulate nuclear wastes at Hanford.

ATTACHMENT 2

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

**Prepared for Hanford Challenge
May 3, 2010**

**Review comments by:
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A discussion of Clean Closure and groundwater sacrifice

My first concern with the EIS is that it does not consider and evaluate a true clean closure alternative. By “clean closure” I refer to the concept of removing the tank waste, tank structures and ancillary equipment and excavation/removal of the vadose zone contamination plus the cleanup of the groundwater contamination resulting from past leaks, spills, and intentional discharges from the tanks and adjacent cribs and trenches.

Alternatives 6 A & B with the option of clean closure of the adjacent cribs best represent a clean closure alternative. However, Alternatives 6A&B do not include cleanup of the groundwater. Section S.1.3.2 indicates that groundwater remediation decisions are not made or included in the proposed actions in the EIS. The EIS does not adequately explain exactly what that means or how key groundwater decisions impacting the risk assessments are represented in the risk assessments for each alternative.

In my review of the EIS I attempted to determine if there was an alternative that resulted in removal or treatment of all forms of contamination, from the tank farms to the vadose zone and groundwater. I was not successful due to the difficulty in determining just what contamination sources went into what portions of the models of each alternative.

In the Summary section of the EIS, key figures are the calculated radiological risk from drinking groundwater at the core boundary for three radiological sources including: 1)the tank farms cribs and trenches (Figure S-16), 2) the past leaks at the SSTs (Figure S-17) and 3) tank closure residuals, ancillary equipment and retrieval leaks (Figure S-18).

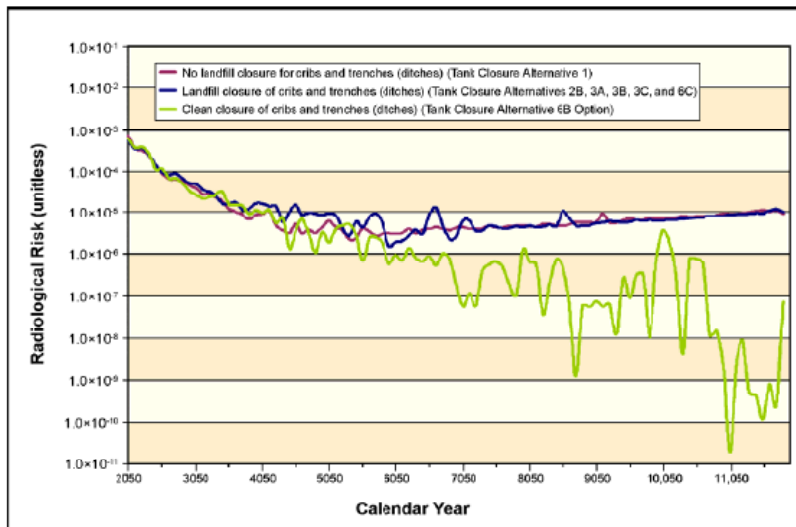


Figure S-16. Lifetime Radiological Risk for the Drinking-Water Well User at the Core Zone Boundary due to Releases from the Six Sets of Cribs and Trenches (Ditches)

Figure S-16 shows long-term radiological risk from releases from cribs and trenches. Clean closure of cribs (Alternative 6B, light green trace in the figure) includes removal of the contamination sources in the vadose zone. The long-term radiological risk shown on the plot, reflects conditions resulting from an absence of groundwater cleanup. This supports the contention on page S-92 that “Cribs and trenches are major contributors to potential long-term groundwater impacts for all Tank Closure alternatives due to early discharges ...” That is exceptionally true if the groundwater is not cleaned up under the clean close scenario and one drags this groundwater contamination into the risk model that is used to represent a clean closure scenario.

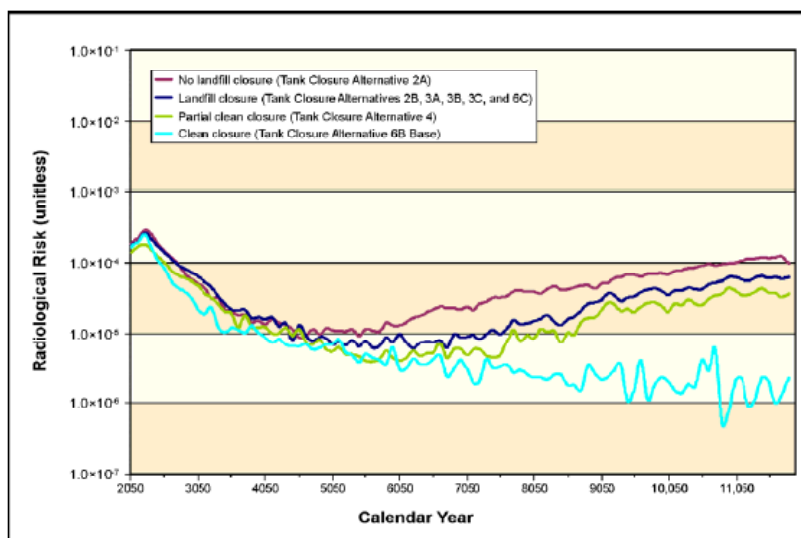


Figure S-17. Lifetime Radiological Risk for the Drinking-Water Well User at the Core Zone Boundary due to Past Leaks at Single-Shell Tank Farms

Figure S-17 shows the long-term radiological risk from past leaks at the tank farms. On page S-93 it indicates that clean closure of the SST Farms means that contamination from past leaks would be removed at all SST Farms. However, groundwater contamination remains and it is left to the reader to figure out that the blue trace in Figure S-17 results from the absence of groundwater cleanup. On page S-93 it states “Past leaks are major contributors to potential long-term groundwater impacts”.

On page S-96 it states that Figures S-16 and S-17 show that clean closure would provide little reduction in long-term impacts to groundwater before CY6000 due to past leaks and cribs and trenches. This is only true because their clean closure scenario is not a clean closure. Under Alt 6A&B with option, the groundwater contamination from past leaks is not remediated and is included in the clean close alternative risk calculation creating substantial risk. As a result, when you compare the relative risks, there is little reduction in long-term impacts to groundwater resulting in the false conclusion of the true benefit of an actual clean closure scenario.

Figure S-18 shows the tank farm closure risk from drinking groundwater at the core zone. Specifically absent from that graph is a plot for Tank Closure Alternative 6B because “there are no long-term human health impacts...” because the “groundwater sources ... are completely removed under this alternative” *pg S-95*. In other words, when you remove the contamination, the long-term risk is gone. That concept of clean close as applied to Tank Closure also needs to be applied to the closure concept for the crib and trench sources and for the past leak sources.

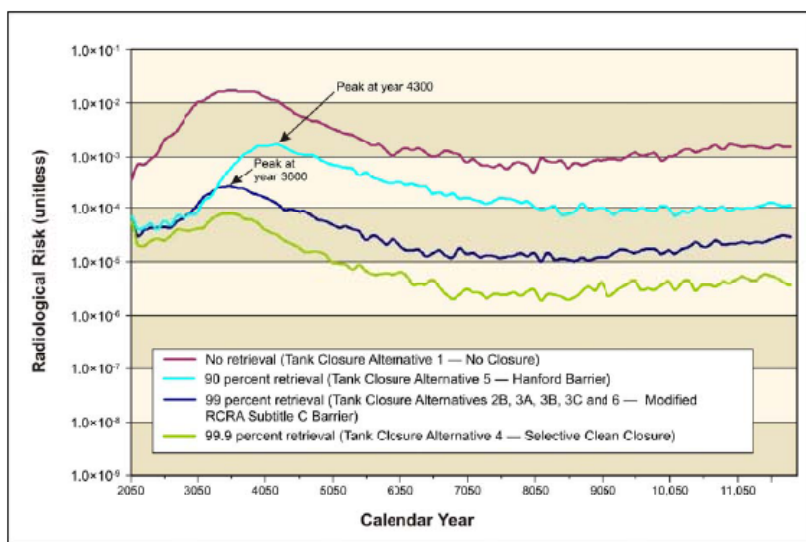


Figure S-18. Lifetime Radiological Risk for the Drinking-Water Well User at the Core Zone Boundary due to Releases from Tank Farm Residuals and Ancillary Equipment and to Retrieval Leaks

On page S-96 the DOE proffered alternative of landfill closure of the tank farms and associated cribs versus clean closure of the same, is based on the excessive cost of clean

closure and on the conclusion that clean closure would only provide an incremental decrease in radiological risk. That argument is apparently based on the preceding Figures S-16 and S-17 which in effect, compares the relative long-term radiological risks only for alternatives where the groundwater is not cleaned up and does not compare risks to a true clean-closure alternative.

Figures S-16 and S-17 are terribly misleading without a clear explanation of what contamination is and is not represented in the radiological risk determination. DOE's argument of only incremental decrease in radiological risk with clean closure is not a valid argument when comparing it against the risk from an alternative that includes cleanup of the groundwater during and following the retrieval period.

It appears that the DOE is prematurely assuming a cleanup path where the groundwater at the tank farms will not be remediated. This approach biases the risk assessment by producing significant long-term impacts to groundwater that may not necessarily be present. Since DOE's alternative preference is based on a comparison of relative alternative risks, at least one of the alternatives must include groundwater cleanup for a proper risk comparison. In effect, the DOE is arguing that the groundwater is already contaminated and we will only be making it a little worse by adding add a little more contamination that will exceed groundwater standards.

This argument amounts to making the determination in the EIS that the groundwater beneath the tank farms is irretrievably contaminated and now, since it is already contaminated we might as well contaminate it some more and really make it irretrievable and save some money on cleanup. This is all done in light of the fact that the EIS is not intended to make decisions on cleanup of the groundwater.

Including past groundwater contamination in all Alternatives creates a groundwater sacrifice zone by default yet the EIS provides no mention or discussion of this. In fact, it was very difficult to determine how the existing groundwater was included in the risk calculations.

Vadose zone flow and transport model validation

On pages N-6 and N-7 the EIS discusses the selection of van Genuchten parameters for the vadose zone model using a process described in Figure N-1 where they match parameters with actual conditions. In effect, this is an empirical calibration of their vadose zone model where they change some of the variables of the basic equation to make the model a better match to actual conditions.

Three data sets are used to represent contamination migration conditions resulting from a single vadose zone source. One of the data sets is discussed and explained in Appendix N.

Figure N-5 shows the historical gross beta activity and Tc-99 concentration measured in the groundwater beneath the BY cribs (well 299-E33-7). The source of this groundwater contamination is reported to be from the BY cribs.

Figure N-6 shows the modeled or predicted Tc-99 concentration, although I do not understand why they did not plot the data on Figures N-5 and N-6 on a common graph.

On page N-7, the EIS indicates that the measured and predicted Tc-99 concentrations are in general agreement and the predicted Tc-99 concentration profile shows qualitative agreement with the gross beta profile. I am not certain what this means relative to the model and I would normally request that a sensitivity analysis be done to provide an estimation of the error of the model, but this is all moot point as I will explain.

I will mention first that the predicted Tc-99 curve reaches a steady state concentration of near 20,000 pCi/L after 50 years. On the other hand, measured Tc-99 concentration shows an increasing trend from about 500 pCi/L to 20,000 pCi/L and rising. In my opinion, this does not appear to be a qualitative match nor does it appear to represent a condition of general agreement.

On review of the Tc-99 groundwater data shown in Figure N-5, I conclude that a clear rising trend in groundwater contamination is occurring at this location from about 1983 to the present. This trend indicates a dynamic groundwater contamination condition, not a steady state flow as modeled, and it indicates that an active vadose zone plume is just now entering the groundwater in the immediate vicinity of the well.

Unfortunately, the Tc-99 contamination shown by Figure N-5 originated from the BY Farms or from the large leaks from tank BX-102. It did not originate from the BY cribs as indicated and it certainly is not from a single vadose zone source. This has all been documented by the Nez Perce and Sobczyk (et al., 2003, 2004), and DOE 2004.

Tc-99 and Uranium have relatively high migration rates. Uranium can be tracked through the vadose zone with passive spectral gamma ray logging, but Tc-99 cannot because it requires actual sampling to determine soil concentration. What Sobczyk and the DOE Grand Junction Office did was to follow the uranium from the BX-102 through the vadose zone on a northward preferential pathway to a place below the BY cribs where it is entering groundwater. This vadose zone data is all correlated with groundwater data including trends in Tc-99, Uranium and Nitrates. This combination of vadose zone uranium plume tracking and correlation with multiple groundwater contaminants makes Sobczyk's conclusions quite solid. These references on the BX-102 contamination plume are all available and the information provided by Sobczyk is summarized in the annual Hanford Site Groundwater Monitoring Report so it is inexplicable why the data would be so totally misused for such a critical thing as calibrating the model forming the basis of the entire risk assessment.

This contamination migration pathway through the vadose zone soil and into groundwater at the B-BX-BY complex as mapped out by Sobczyk, probably represents a

local drainage that drained to the north toward a paleo-channel that ran from west to east between the west area and Gable Mountain. This migration pathway most likely resulted from contamination moving through the soil at or near saturated soil conditions. The near saturated soil conditions resulted from the characteristically large volumes of effluent or tank liquid that was released in the B complex. It is also likely that all of the large volume releases from the area went down the same migration pathway. Because of the near-saturated soil conditions that most likely occurred at the B complex, it is inappropriate to use the BY groundwater data for the empirical calibration process describe in Figure N-1. I believe this shows that the type of vadose zone contaminant migration model used in the EIS is entirely inappropriate for the types of conditions that existed at many of the tank farms.

The vadose zone model should consider and appropriately model the expected saturation of the soil during a large leak or release event as well as the increased soil moisture resulting from placement of gravel covers over the tank farms and the water releases from water line leaks and the massive effluent releases from nearby cribs.

I concur with Sobczyk's interpretation that the rising Tc-99 in the groundwater beneath the BY cribs most likely originated from the BX-102 leak which, along with uranium, is just now reaching groundwater in this area. Current conditions along the migration pathway are probably close to some form of steady state conditions but for the increased infiltration at the tank farms and other recent water releases in the area.

In the above discussion, I used words like "likely" and "most likely" demonstrating an educated but limited understanding of actual site conditions as a result of inadequate characterization of the vadose zone contamination at Hanford. They simply don't have the site characterization data to confirm or reject any theories on subsurface conditions. Likewise, there is obviously also not enough data to do the type of model calibration that was attempted. I believe that the site that is used for the empirical calibration of the vadose zone model must be extraordinarily well characterized both spatially and temporally because the model accuracy is critical for developing and demonstrating accurate risk assessments.

I believe it is entirely premature to make the closure decisions proposed in the EIS before the site characterization is completed and we at least have an understanding of how the contamination migrates through the vadose zone soil. The current vadose zone model using unsaturated flow is inappropriate and the calibration of the model is simply wrong because the contamination actually originated from a different source.

Groundwater Transport Model

The groundwater contaminant transport analysis is described in Appendix O and groundwater transport results for tank closure alternatives are presented in a series of tables from Table O-6 to O-32. Groundwater concentration plots and groundwater plume model results are shown and discussed in Chapter 5.

My first comment about the model is that a description of the physical model that the model represents could not be found. I was looking for areas in the model with high permeability representing old drainage channels and other ties to the actual geology and hydrogeology of the site. Even a basic cross section showing model resolution and the different Ringold layer parameters would have been useful. Questions remain about how well the model represents actual subsurface conditions.

The calibration of the groundwater transport model was accomplished using two tritium plumes but not with any lower mobility contaminant plumes or a plume containing multiple contaminants. The tritium plume calibration model runs appear to represent historical conditions at Hanford.

It is also difficult understand groundwater impacts of each Alternative with no way to compare the groundwater conditions between Alternatives. I cannot determine exactly what contamination went into each model and specifically what were the differences between the sources.

Figure 5-240 shows Alternative 6A base case groundwater total uranium concentration for 2005. This model result apparently does not include existing uranium groundwater contamination and has not been compared to existing conditions. The uranium plume on the north side of the B complex where the uranium concentration exceeds the MCL is not shown (see Missing Groundwater Contamination below)

Relative to the end risk associated with each alternative and the Alternative impact on groundwater it is clear that the no action Alternative 1 will result in widespread groundwater contamination of the Hanford site and rivershore areas. It was difficult to compare groundwater impacts from the rest of the Alternatives because the impacts were similar and there were no comparison plots or discussion of the differences. In addition, the absence of a clean groundwater alternative makes it a game of comparing bad groundwater impacts to slightly worse impacts with no concept of what could be. My interest at least is in assessing the possibility of clean groundwater.

I-129 distribution coefficient sensitivity modeling reported on page O-91, used a soil bulk density of 2.6 g/cm^3 , corresponding to a soil density of 162 lb/ft^3 . An actual in-situ soil density, considering a soil porosity of 25% by volume would be about 110 lb/ft^3 or 1.7 g/cm^3 . This unrepresentative soil density results in inaccurate migration rates in the sensitivity analysis.

The sensitivity of the model to contaminant inventory variations (O.6.5) uses the vadose zone model output for Tc-99 from the “BY cribs” in the calculations. On page O-107 it indicates that the BY crib sensitivity analysis shows “variations of source strength on the order of 50% would result in large variations in the near field ... with resulting variations in (groundwater) concentrations of over an order of magnitude”. This leads to groundwater concentration predictions at the three output points with error ranging from 50% to 100%. In other words, the model shows the groundwater concentration is very sensitive to variations in vadose zone source strength.

This sensitivity to source strength is probably correct, at least for the environmental conditions that are modeled. Unfortunately, the sensitivity test empirical model was based on the BY Crib groundwater plume data and the Tc-99 did not originate from the cribs but from a tank source. As a result there are differences in the vadose zone release to groundwater that are not considered in the sensitivity model. For model quality validation concerns the sensitivity to source strength modeling is totally invalid but the underlying trend conclusion is probably correct, at least for the conditions that were modeled.

It is clear that additional site characterization must be completed before any reliable groundwater contaminant transport calculations or model sensitivity analyses can be completed.

The validity of the other inventory sensitivity calculation in this section (TY cribs) was not assessed due to an inability to review the T complex site characterization data because most of the data and reports were not available either on the web or in the WSU public reading room. However, considering the sensitivity of the BY groundwater model to the inventory and to the uncertainty of the model source term, it can be concluded that the groundwater transport calculation errors are too large to support the risk assessments in the EIS.

Missing Groundwater Contamination

Results of the vadose zone and groundwater modeling as shown in Figures 5-205 to 5-206 are not accurate. All of the figures show very low initial uranium concentrations in the groundwater at this time when we know this is not the case.

I again pick on the work of Dr. Sobczyk and DOE GJO characterization of the B complex as an example where uranium from the BX-102 tank has made its way through the vadose zone soil and entered groundwater where it currently exceeds the drinking water standard benchmark. So current uranium concentrations in the groundwater exceeds anything predicted in the modeling.

My concern is that the EIS apparently missed this groundwater contamination and did not properly assess the resulting long-term risks. I also have concerns that there is no way to determine what specific contamination plumes at Hanford are represented by the models. It is apparent that the BX-102 contamination is not represented.

Somewhere from the source characteristic data of leak volume and composition to the release model, to the vadose zone transport model, the uranium did not make it into the groundwater and is not accounted for in the risk assessment.

“Possibly” some Short-term environmental consequences

Some short-term environmental consequences/impacts do not appear to have been reviewed, evaluated, assessed or recognized in the EIS. I refer to the short-term environmental impacts resulting with existing groundwater contamination as well as the

deep vadose zone contamination that is currently entering groundwater. Page 4-66 mentions that direct short-term impacts of tank closure activities are “mainly” limited to retrieval induced leaks but it does not mention anything about impacts from past leaks or cribs and trenches.

Even under the no action Alternative 1 the EIS indicates (pg 4-67) “no short term impacts would occur because no tank waste retrieval would be performed”, implying that only retrieval leaks are considered as short term impacts.

Under the clean closure Alternative on page 4-62, it mentions historical tank leaks and the fact that contamination has migrated deep into the vadose zone “and possibly to the water table” (underline added). This is about as close to an admission that we will get that contamination from tank leaks has reached groundwater. In reality this is a statement of the uncertainty associated with the contamination distribution in the vadose zone and the extent of migration. It supports a conclusion that we don’t have adequate site characterization information to properly evaluate or assess short-term impacts. The uncertainty is so great at this point that there still appears to be some confusion over whether or not the contamination may “possibly” have reached groundwater. It seems to me that this should possibly be resolved before trying to assess environmental impacts.

It is all very confusing trying to figure out where and how the EIS modeling considers and includes the existing deep vadose zone contamination and groundwater contamination.

Short-term environmental impacts to groundwater resulting under Alternatives 1 and 2A (no Closure), should be compared to the short-term environmental impacts from landfill closure and clean closure in order to properly evaluate and quantify the true benefit of removing the contaminated vadose zone soil and cleaning up the groundwater.

At Hanford we find several tank farms where the vadose zone contamination is now entering the groundwater, including the B farm complex, C farm, SX farm and T farm. At other farms this conclusion of groundwater contamination is not as certain due to a lack of site characterization data.

These short term impacts should be identified and evaluated in the EIS so that they may be prioritized in the overall scheme of the closure process to perhaps address some of the short-term impacts on a priority basis and thereby prevent some of the potential long-term impacts.

The BX-102 contamination plume comes to mind as a specific example where impacts to groundwater are occurring and will increase in the short-term. In this case, a small pump and treat effort may be advisable to minimize the extent of the new groundwater plume until clean closure can occur and the groundwater plume can be remediated.

Another example is the SX Farm where very high concentrations of Tc-99 contamination have been identified in the groundwater. Over the short-term remediation and institutional control period these plumes could increase and spread to cause very

significant long-term impacts on the groundwater. Right now, they are short term impacts that need to be recognized, addressed and resolved in the EIS. Perhaps proper consideration will lead to cleanup of a small groundwater plume rather than expansion of the problem until an irrecoverable condition exists.

Discussing short-term impacts to groundwater is moot point however if the EIS does not address groundwater remediation or at least adopt a clean-groundwater interim management goal.

As discussed above, the DOE preference for the landfill closure Alternative versus the clean-closure alternative is based on the incremental difference in risk that results with a less-than-clean closure. I believe that if the short-term impacts to groundwater were properly considered, that preference would have to be reconsidered.

Assumed Sound Source Uncertainties

If we accept the basic conclusions of the groundwater sensitivity analysis presented in Appendix O and discussed earlier in this review, we understand that the groundwater contaminant concentrations are sensitive to source term strength and that a 50% change in source strength could result in a 10 fold increase in groundwater concentration. Source strength refers to the output of the vadose zone portion of the model.

Under the EIS clean closure Alternative 6 A&B, the resulting groundwater contamination from past leaks and adjacent cribs and trenches has a large impact on the long term groundwater contamination levels and associated risk. The existing contamination migrating through the vadose zone and into groundwater is the principal source of groundwater contamination that occurs with the clean close Alternative.

This leads to Appendix M and a review of the releases to the vadose zone. Table M-3 provides tank leak volume estimates which create the principal clean-close contamination input to the vadose zone model and has the greatest impact on future groundwater contamination, except for the in-tank waste that would be released under the no action Alternative. My concern is that, except for a few cases, the tank leak volume estimate data provided in Hanlon and shown on Table M-3 are often nothing more than biased guesses.

None of the tank leaks have been adequately characterized to determine the nature and extent of the contamination and allow a correlation of liquid loss data to the existing contamination distribution. Even vadose zone contamination from the large leak from T-106 has not been properly characterized for we do not know the extent of the deep contamination and the extent of groundwater contamination from that leak. In the early 1990's a characterization effort was undertaken in an attempt to resolve concerns by the GAO. That characterization effort started with a plan for about 10 borings but was quickly reduced and turned into a site characterization effort that included only one new borehole.

Tank leak volume estimates used in the vadose zone modeling to determine groundwater impacts are severely biased toward the low-volume extreme and selectively ignore significant leak data. For example, tank SX-109 experienced several leak episodes and various leak volume estimates were produced over the years using different types of analyses. In 1987 Lewis (1987) prepared a leak volume estimate that determined as much as 56,000 gal of waste could have leaked from the tank. This included an estimate of 33,000 gal that leaked from the tank between 1965 and 1973 when contamination was detected in the laterals below the tank and they recorded a 4-inch drop in liquid.

In 1992, it was determined that the 56,000 leak volume estimate was too high so the leak volume estimate was reassessed by an “independent” contractor (DOE, 1992). The new estimate was completed by mere amateurs who had little knowledge of the subsurface contamination migration at Hanford (nor did anyone at that time). The new estimate was based on a phony calculation of the contamination distribution in the soil, which was largely uncharacterized at that time, and postulated that most of the vadose zone contamination originated from tank SX-108. From this postulation, the leakage estimate was reduced to 10,000 gal. This report was not subjected to a qualified peer review and the analysis completely ignored the previous estimate (Lewis, 1987) which was based on in-tank liquid level drop combined with plume detection in the laterals. The new leakage estimate was included in Hanlon (Table M-3) where it remains as the official estimate.

In 1995 a rigorous analysis of historical process data was completed by Agnew (et al., 1995 and Agnew and Corbin, 1998) indicating much larger leak volumes for most of the SX Farm tanks. That information appears to not have been included in Table M-3.

I believe that to determine environmental impacts from previous tank leaks, the DOE should perform an unbiased analysis of tank leaks and the leak volume estimates should be correlated and verified with vadose zone characterization data. Unfortunately correlation of the tank leak data with the vadose zone data is not possible at this time because the nature, extent and distribution of contamination in the vadose zone soil has not been determined. Considering the sensitivity of the contaminant migration model, until the tank leak estimates are properly determined with the application of a valid scientific method, I do not believe there is adequate precision in the tank leak volume data to reliably calculate groundwater impacts.

Regarding the statement that “Sixty seven of the SST’s are known or suspected to have leaked liquid waste to the vadose zone between the 1950’s and the present, although it is likely that some of the tanks have not actually leaked”; This statement indicates a level of uncertainty associated with determining whether or not a tank has leaked and it demonstrates the bias in regards to tank leak status designations. This of course, leads to questions and concerns about the source term and source term bounding conditions used for the vadose zone modeling and groundwater impacts assessments.

First, I must object to performing an analysis of environmental impacts when they still haven’t figured out which tanks leaked. This historical argument over tank leak designation and the associated source term uncertainty would not exist if it were not for an

inadequate characterization of the vadose zone contamination around the tank farms (see comments above).

To move forward with vadose zone modeling in light of characterization inadequacies would require an extensive investigation and analysis of the uncertainty associated with the tank leak source term. Such an assessment must be prepared in a scientific and unbiased manner. Once the source term uncertainties are determined, upper and lower bounds for the source term would need to be established and modeling of the bounding source term conditions would need to be accomplished.

Even with the known uncertainty associated with tank leak volume estimates, the draft EIS provides no bounding assessment or even a sensitivity analysis of the effect of varying tank leak source volumes. The only such sensitivity analysis in the EIS was that completed for the groundwater model as discussed above.

The statement shown above “that some of the tanks have not actually leaked” clearly indicates a bias in the tank leak designation. This is a very well developed historical bias that has always been present at Hanford and clearly continues. The truth is that there are some tanks that are listed as sound but are actually leakers. Tanks at Hanford are categorized as “sound” or “assumed leakers” instead of calling them “assumed sound” and “leakers” as would be appropriate.

In 1998, an assessment of the vadose zone contamination (US DOE, 1998) concluded that contamination plumes at the base of tank TY-102 “most likely resulted from leakage from tank TY-102”. This contamination was located right at the base of the tank on the side of the tank where no other tanks are nearby that could have contributed to the plume. This condition was about as clear of a conclusion for tank leak that can be found by assessing the soil contamination distribution.

As a result of the vadose zone findings, a committee was collected to reassess the tank leak designation. That group quickly divided into two respectively intractable groups and the issue could not be resolved. As a result, a consultant was called in to establish a decision making process for tank leak designations. The consultant developed a tank analysis process (Epple, et al., 1998) based on a Bayesian logic framework and tank TY-102 was used in an example of the implementation of that process. The result of the test run was a 95% probability determination that the tank had leaked versus a posterior probability of no leak of 45%.

In 1999, the use of the newly developed tank leak designation was discontinued and tank TY-102 remains listed as a “sound” tank.

The bias described here relative to the tank leak designations is clear and it is also clear that Table M-3 is missing contamination release estimates from tanks TY-102, BY-111 and BX-106. Data indicates that all three tanks have leaked.

As long as the very basic question about whether or not a tank (or 149) has leaked remains uncertain, I do not believe the estimate of the vadose zone source term is adequate for assessing risk. If, in spite of this source term uncertainty, we were to move forward with the environmental assessment, bounding conditions on the source term would have to be established and the model would have to be run with the high and low extreme conditions.

The uncertainty of a tank's leak status would all but disappear if the vadose zone soil contamination is properly characterized and the bias is removed from tank leak status decisions.

Summary of critical concerns

My review was focused on the tank farms and associated contamination in the tanks, vadose zone soil and groundwater. I followed the contamination through the model to see how the different contamination sources are dealt with (or not) in each component of the risk assessment model.

The most important concern is that the EIS does not consider and evaluate a true clean closure scenario that includes cleanup of the groundwater, deep vadose zone contamination and groundwater contamination from past practices facilities. Instead, all of the Alternatives fail to meet regulatory compliance standards for groundwater contamination at some point. If alternatives are presented and analyzed in the EIS that fail to meet regulatory standards, that should be identified, discussed and explained in the EIS. All Alternatives should be compared to a true clean closure alternative.

The EIS also does not include or consider decisions about groundwater remediation at the tank farms. Instead, all of the Alternatives create groundwater sacrifice zones by default because all Alternatives fail to meet regulatory compliance standards for groundwater. Long-term groundwater impacts would result in extensive regions of contamination along the Columbia River shoreline making the area uninhabitable. Yet the EIS states that groundwater decisions are not a part of this EIS. The DOE cannot say that they are going to clean up the tank farms by sacrificing the groundwater, and then claim that decisions about groundwater cleanup are not part of the EIS. Clearly the EIS must include consideration of groundwater cleanup decisions.

I believe the invalidity of the vadose zone model is demonstrated by the fact that there is a complete misunderstanding of the source of the contamination plume that was used in the attempt to calibrate the vadose zone model. Vadose zone modeling is not properly calibrated and is inappropriate for assessing risk from contaminant migration through the vadose zone.

This complete misunderstanding of the source of that contamination is caused by inadequate characterization of the nature and extent of the vadose zone contamination. None of the larger vadose zone contamination plumes at the tank farms have adequately been characterized to the extent that they can be used to perform the type of model validation that is needed for the risk assessments.

When some of the massive releases occurred, soils were at near-saturation conditions, causing downward flow along preferential drainage pathways to the groundwater. This type of contaminant migration is common at most of the Hanford tank farms as indicated by patterns of contamination distribution and as is found in the similar geologic conditions in the lower Columbia Basin. With these conditions, it is inappropriate to use the type of vadose zone contamination migration model that was used in the EIS.

The first step to completing a valid risk assessment is to characterize the nature and extent of contamination in the soil around the tank farms. This means tracing the contamination from the source through the unsaturated zone soil and into groundwater at most of the contamination plumes. Currently active sources of groundwater contamination are not included in the risk models. Active sources of vadose zone contamination are also not included in the risk models. I believe it is premature to make tank closure decisions and create groundwater sacrifice zones until the subsurface conditions are understood and vadose zone plumes are adequately characterized.

The EIS should also evaluate a large scale soil excavation/removal strategy for deep contamination removal.

I recommend that the DOE should revise and reissue the draft EIS and not move forward with a final EIS. The problems with the existing draft EIS are too extensive to simply fix. A complete rewrite is required after site characterization is complete and after valid risk assessment models are developed.

DOE should adopt an interim policy that the farms will be clean-closed. Tank farm closure decisions can be made after completing a more comprehensive characterization of the groundwater and vadose zone in order to understand the basic characteristics of the contamination migration processes.

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