Report on the

March 16, 2004

Environmental Evaluation Group (EEG) Sponsored

Workshop

On the U.S. Department of Energy (DOE)

Plans to dispose of

Hanford High-Level Radioactive Waste

At the

Waste Isolation Pilot Plant (WIPP)

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1. Forward

The 2004 EEG sponsored Workshop was held to gather information regarding the plans, at that time, by DOE to bring to WIPP for disposal radioactive waste contained in high-level radioactive waste tanks at Hanford.

A not unreasonable question is, "Why prepare a report on a Workshop that was held 9 years ago?" There are five main reasons for the preparation of this report:

First, EEG funding was eliminated by the DOE shortly after the workshop was held and thus we were not able to complete the report on the Workshop.

Second, the DOE recently announced plans to bring essentially the same tank waste to the WIPP for disposal.

Third, we recently read an account of the statement by Richard Huizinga, Senior Advisor in the DOE's Office of Environmental Management at the 2013 Waste Management Conference: "Huizinga noted that much of the challenge (ed note: the ongoing effort to complete the waste treatment plant) stems from the fact that the wastes from different reprocessing methods were combined in underground tanks and were allowed to sit for some 30 years." May 2013 Nuclear News, page 69.

Fourth, the DOE announced in December 2009 (FR 67189) that "DOE is now expressing its preference that no Hanford tank wastes would be shipped to WIPP."

Fifth, we are concerned that high-level waste (HLW) might be mixed (or perhaps already mixed) with transuranic waste which would then be shipped to WIPP.

Accordingly, in view of the fact that DOE again wishes to bring Hanford tank waste to New Mexico, we believe it is in the public interest to provide a record of the 2004 Workshop.

George Anastas

James K. Channell

June 2013, Albuquerque, New Mexico

2. Summary

All presentators had responsibilities or interests concerning the tank waste at Hanford. However, none were specifically concerned with transuranic waste (TRU) classification for disposal at WIPP. While some speakers believed it may be possible to separate a TRU waste fraction out of the waste in the tanks, none attempted to judge whether this waste would meet the WIPP Waste Acceptance Criteria for disposal at WIPP.

The WIPP Land Withdrawal Act (LWA) definition of TRU waste precludes high-level waste. Judge Winmill's Decision states: "It is undisputed that the waste at Hanford, INEEL, and SRS is highly radioactive and the result of reprocessing. No solids have yet been extracted from the liquid waste at those sites and treated to reduce fission products. Thus the waste at issue in this case falls within NWPA's definition of HLW. (Memorandum Decision, July 2, 2003, p.11)"

None of the presentations attempted to demonstrate that any of the tanks had never received HLW.

3. Introduction

During the Fall of 2003 there were several newspaper articles regarding radioactive and hazardous waste stored at various DOE sites. These articles did not provide a great deal of technical detail, but did state that the proposed site for the waste was the WIPP. The WIPP is a repository for the disposal of transuranic waste generated by atomic energy defense activities of the United States Government.

a) Atomic Energy Defense Activities

These activities took place at numerous sites across the country, including Hanford, Idaho National Engineering and Environmental Laboratory (INEEL), the Savannah River Site (SRS), Oak Ridge National Laboratory (ORNL), Argonne National Laboratory (ANL), and others.

EEG understood from the newspaper articles and conversations with representatives of the DOE that some of the tank waste, the waste that meets the definition of transuranic waste, at Hanford may be the first tank waste proposed to

be disposed at the WIPP. Accordingly, EEG focused its efforts on the waste in those specific tanks in order to obtain detailed scientific information from specific agencies and individuals most knowledgeable about the Hanford tank waste situation. The EEG organized a public Workshop that was held March 16, 2004 at the Glaesner Training Center in Albuquerque, New Mexico. The Workshop focused on technical issues relating to the tank waste at Hanford believed to meet WIPP disposal requirements.

The EEG was fortunate to have representatives of the DOE Office of River Protection (ORP), CH2MHill Hanford Group (a contractor to the DOE Office of River Protection), the DOE Carlsbad Field Office, the Washington State Department of Ecology, the Washington State Department of Health, the Region 10 Office of the U.S. Environmental Protection Agency (EPA), and the Natural Resources Defense Council (NRDC) present information on the topic. In addition, staff from various organizations, members of the public and press participated in the discussions at the Workshop.

b) Hanford Operations

Beginning in 1944 the Hanford Site in Southeastern Washington State served a major role in atomic energy defense activities relating to the production of plutonium for nuclear weapons and associated research activities. The DOE and its predecessor agencies were responsible for the planning, design, construction and operation of the facilities at the Site. The Site contained a myriad of facilities including nuclear reactor fuel fabrication facilities, nine nuclear reactors for the production of plutonium, four chemical separation plants for the separation of plutonium from irradiation nuclear fuel (T and B Plants, REDOX and PUREX), one chemical separations plant to recover uranium from tank waste (U Plant), plutonium concentration and purification facilities, large underground tanks in which radioactive waste and hazardous waste from chemical separations and facilities operations were stored, and various nuclear and radiation research facilities related to atomic energy defense activities. In 1987 the last production reactor, N-Reactor, ceased operation and in 1990 the last chemical separations facility, PUREX, ceased operation.

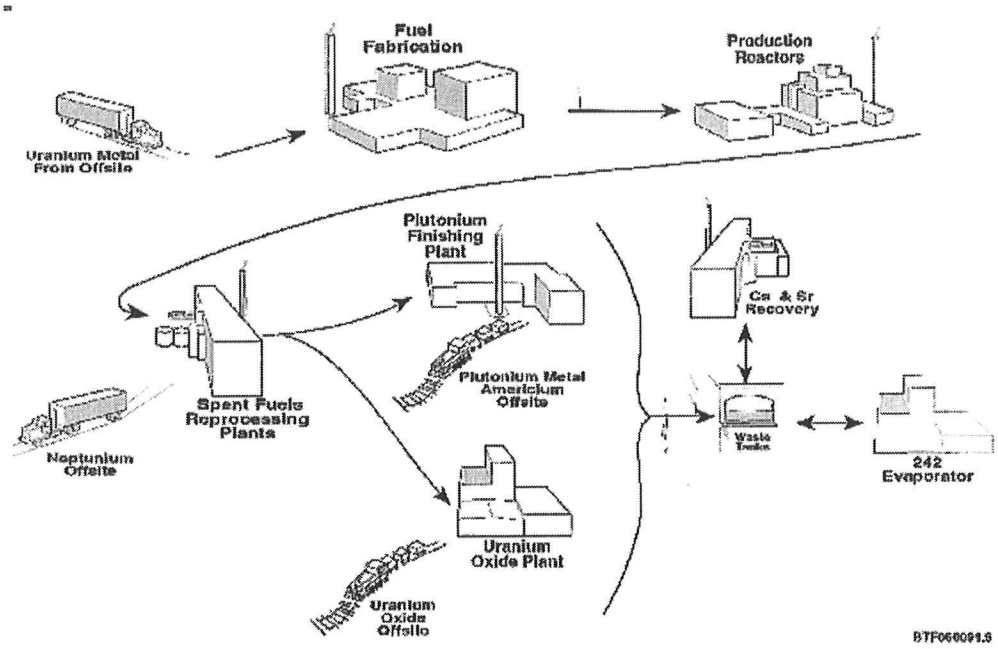

Figure 1: Hanford Defense Production Facilities (1944-1990)

Source: Presentation by Ms. Suzanne Dahl

c) The Hanford Tanks

There are 149 large single shell tanks that were constructed between 1943 and 1964, ranging in capacity from 55,000 to 1,000,000gallons. There are also 28 large double shell tanks that were constructed between 1968 and 1986, ranging in capacity from 1,000,000 to 1,100,000 gallons.

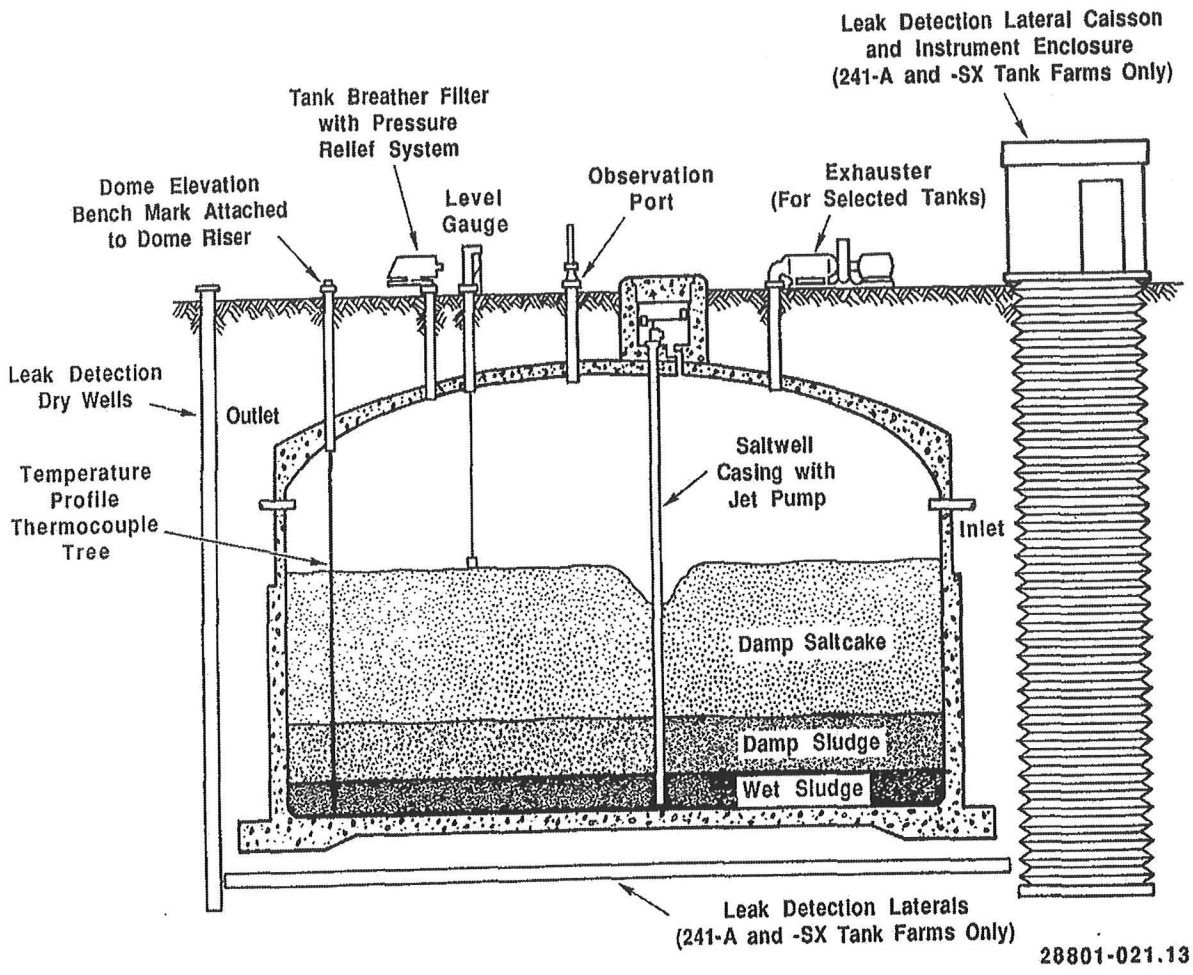

Figure 2, Typical Single Shell Tank (Source: http://www5.hanford.gov/pdw/fsd/ar/fsd0001/fsd0003/D195065510/D195065510_1415.pdf)

The 177 tanks contain radioactive and hazardous waste produced during more than 40 years of atomic energy defense activities. Based upon a January 1, 2001 estimate, these tanks contain about 194 million curies of radioactivity and hazardous wastes including over 166,000 metric tons of chemicals in approximately 55 million gallons. The volume of waste in the tanks consists of liquid, saltcake, sludge and interstitial liquid.

Hanford Tank Waste Inventory

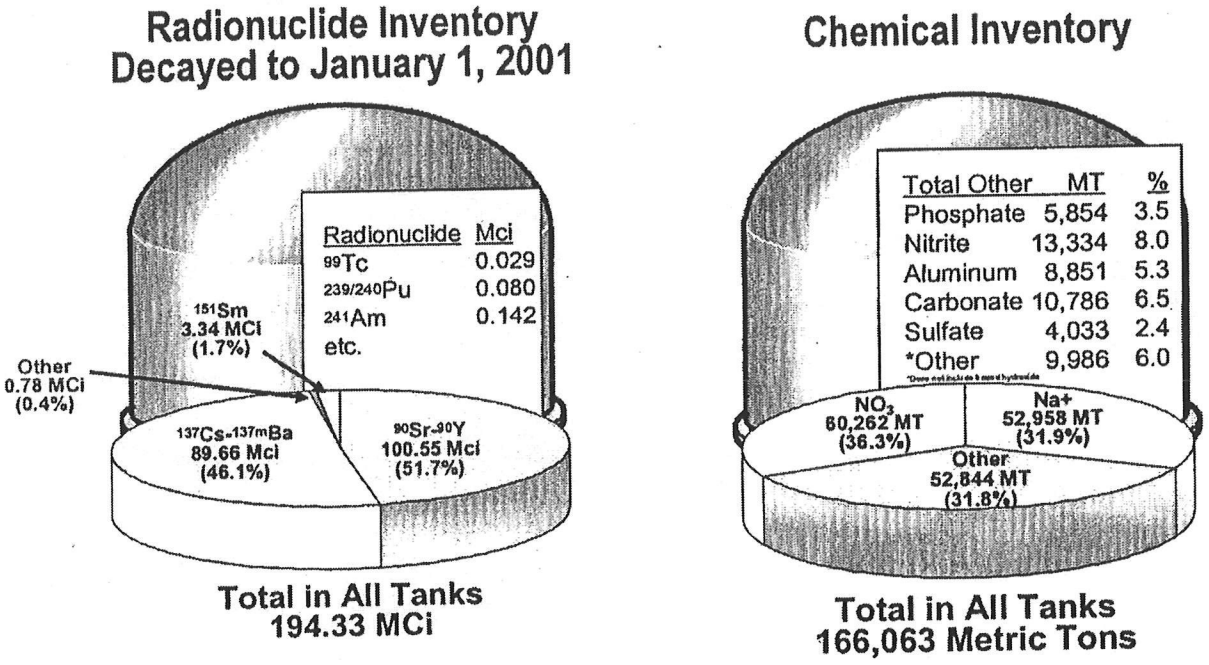

Figure 3: Approximate Hanford Tank Waste Inventory

Source: Presentation by Ms. Suzanne Dahl

In addition to the 177 large tanks at Hanford. There are approximately 40 miscellaneous underground storage tanks (MUST) which also contain various wastes. Single shell tank ancillary equipment, (i.e.: diversion boxes, valve pits, flush pits, single shell tank pits, waste transfer vaults, and transfer lines) also contain waste. The MUST and ancillary equipment are mentioned here for completeness, but were not the subject of the March 16, 2004 Workshop.

4. Abstract of Presentations and Discussions

a) R. Paul Detwiler, DOE Office of the General Counsel and Acting Manger of the DOE Carlsbad Field Office

Dr. Detwiler presented three definitions of High Level Waste:

The WIPP Land Withdrawal Act (which referred to the definition in the Nuclear Waste Policy Act of 1982)

The Nuclear Waste Policy Act of 1982: (12) 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 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. 42 U.S.C. §1010(12)

The State of New Mexico and the U.S. Department of Energy Agreement for Consultation and Cooperation: G. The term "high level waste" means defense waste, in the form of the solidified product of the first cycle solvent extraction *or similar process by which uranium and plutonium are recovered from irradiated reactor fuel.* Article II (G) {emphasis added}

He then discussed the prohibitions on the disposal of high-level waste at the WIPP contained in the WIPP Land Withdrawal Act (Sec. 12) and the 1981 State of New Mexico and U.S. Department of Energy Agreement for Consultation and Cooperation.

He discussed the definition of transuranic waste contained in the WIPP Land Withdrawal Act: waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste with half-lives greater than 20 years except for (A) high-level waste; (B) waste that the Secretary has determined, with the concurrence of the Administrator, does not need the degree of isolation required by disposal regulations, or (C) waste that the Nuclear Regulatory Commission has approved for disposal on a case-by case basis in accordance with part 61 of title 10, CFR.

He went on to indicate that the early on problem (ed note: at Hanford) was the indefinite storage of tank waste and it did not make sense to impose different management regimes on tanks that contained high-level waste and those that contained other wastes.

Indeed, based upon discussions following the presentation and the subsequent presentation by Dr. John Kristofzski, Waste Disposal Strategic Planning Director and Mr. Rob Yasek, TRU Project Manager, Office of River Protection, U.S. Department of Energy, the tanks contain a mixture of chemical waste, high-level radioactive waste and transuranic isotopes.

b) Suzanne Dahl, Project Manager for the Hanford Tank Waste Issues, Washington State Department of Ecology

The Department of Ecology's (Ecology) mission at Hanford is to provide environmental regulatory oversight to protect human health and the environment and the ecosystem around the site. Ecology is the State Agency responsible for the Tri Party Agreement which began in 1989 with the Hanford Federal Facility Agreement and Consent Order. The three parties involved are Ecology, the US Environmental Protection Agency, and the DOE. The Agreement establishes the primary framework, both in CERCLA and RCRA, for the Hanford cleanup. The Agreement addresses the radioactive mixed waste in the tank farms through the RCRA provisions. Washington State issues permits for tank farms, treatment facilities, and disposal facilities that involve radioactive mixed waste through its delegated RCRA authority. The Agreement establishes milestones to define the cleanup mission at Hanford. Three milestones relevant to this workshop are: (1) M-44-00 Characterization of tank waste; (2) M-45-00 Retrieval and Closure of all the single shell tanks by 2018; and (3) M-62-00 Pretreatment and Vitrification of both high level and low activity waste by 2028.

Pathways to disposal include pretreatment and separation into a HLW fraction (10%) and low activity fraction (90%). The low activity waste (LAW) would go through a vitrification process and disposed onsite. HLW would go through a vitrification process and sent to a geological disposal facility. Various timelines have been established in the Agreement and some schedules have already slipped. Recently, the DOE has begun discussions with Ecology to escalate the cleanup process by abandoning the HLW and LAW vitrification processes. DOE and Ecology are in discussions of different treatment processes and resulting waste forms that could shorten the timeline to closure. Ecology's primary concern is that eventually all waste will be properly treated and disposed. There is a fear that some plans of action could result in some of the tank waste being "orphaned" either in the tanks or onsite without proper treatment.

Ecology has received and agreed to a Notice of Intent for the location of a TRU Mixed Waste (TRUM) treatment and packaging facility. Ecology has agreed that the siting of this facility meets the criteria for siting. However, Ecology recognizes that they are not the decision maker for determination of TRUM or for disposal at WIPP. They will not approve a TRUM treatment facility until DOE has obtained all approvals necessary for disposal at WIPP.

In response to a question about the MUST tanks, Ms. Dahl said that little was known about them, they were not included in any of the timelines, and were not believed to contain TRUM. There was discussion about the NRC's determination of "waste incidental to reprocessing" at Hanford. Ms Dahl said this was the definition that led to the plan to dispose the 90% of the waste that was LAW onsite.

c) John Kristofzski, Waste Disposal Strategic Planning Director, CH2MHill and Rob Yasek, TRU Project Manager, Office of River Protection, DOE

The presentation provided background of the Hanford Site, including the structure of single shell and double shell tanks, waste routing from the 221-T Plant, waste routing from the 224-B Plant, waste routing from the 221-T Plutonium Concentration Building, waste routing from the 224-B Plutonium Concentration Building, history of the surface level in the waste tanks, color photographs of the interior of several tanks and concentrations of TRU, Cs-137 and Sr-90 in tank sludges. The Bismuth Phosphate Chemical Separations Process was used at both the 221-T and 221-B Plants. T Plant was the first chemical separations plant at Hanford and B Plant was a duplicate of T Plant.

Contents of 20 tanks were identified in the presentation as candidates for disposal at WIPP:

T-104, T-105, T-107, T-110, T-111, T-112, T-201, T-202, T-203 and T-204 (associated with the operations of T-Plant, 221-T, and the T-Plant Plutonium Concentration Facility, 224-T);

B-107, B-110, B-111, B-201, B-202, B-203, B-204, (associated with the operations of B-Plant, 221-B, and the B Plant Concentration Facility, 224-B);

SY-102 originating from the Plutonium Finishing Plant; and

AW-103, AW-105 originating from PUREX reprocessing, a process that replaced both the Bismuth Phosphate and the subsequent REDOX chemical separations.

The presentation also alluded "each tank and its contents are different". During the subsequent discussions it appeared that, over the years, from 1943 until perhaps 1980, there was co-mingling of wastes from various tanks and it did not appear that origin of wastes in tanks accurately reflect the wastes that were added or transferred to the tanks over the time period.

d) Allen W. Conklin, Air Emissions and Defense Waste Section, Office of Radiation Protection, Washington State Department of Health

The Washington State Department of Health (DOH) has a supporting role to Washington's Department of Ecology, and is also an independent regulator for radioactive air emissions at the Hanford Reservation. Hanford has 300 radioactive emission units, 30 of which are significant. Most of these 30 units are tank farms and are considered to be HLW. HLW activities licensed by the DOH include: management of wastes and transfers; pumping to remove free liquid; tank sluicing of SST's; maintenance of facilities; evaporation to save tank space; and treatment and stabilization of wastes. In regulating these activities, the DOH attempts to establish a balance between environmental protection and added risks to workers performing the cleanup.

The DOH considers the eight B and T 200 series tanks proposed as TRU to be among the best characterized tanks. Some tanks have not been sampled at all and their characterization is based on tanks with similar types of waste. Some tanks have had only a few samples and others have been sampled only for total alpha activity and total organic carbon. For these tanks, uncertainties can be high. The DOH is uncertain about the accuracy of inventory estimates in the current application.

Most tanks are considered to be HLW and some are clearly LLW. However, the DOH considers 8 to 20 of the tanks to be TRU. Their definition of TRU considers "how far is the waste removed from the first cycle of fuel dissolution". They recognize that the ambiguity of the definition of HLW in the Nuclear Waste Policy Act allows for differences of opinion in classifying TRU. Also, waste

classification is not important to the DOH because they base their licensing conditions on radiation dose to the public.

e) Thomas Cochran, Senior Scientist, Natural Resources Defense Council, Washington, D.C.

Dr. Cochran discussed the July 2, 2003 court judgment regarding the validity of DOE Order 435.1 and the implications of the court decision for disposal of radioactive waste contained in the high level waste tanks at Hanford, Savannah River (SRS), Idaho National Engineering Laboratory (INEEL), and the West Valley Demonstration Project. The Case {NRDC v. Abraham, 271 F. Supp.2d 1260 (D.ID.2003)} was argued before Judge B. Lynn Winmill of the U.S. District Court in Idaho. This lawsuit was about the waste remaining in the tanks and not about waste removed from the tanks, treated, and solidified.

A central issue in the case was the definition of HLW in the Nuclear Waste Policy Act (NWPA) of 1982. In 1999 the DOE promulgated DOE Order 435.1 which permitted DOE to unlawfully redefine HLW as "incidental waste" if the waste met criteria set forth in the Order. Include in the criteria was the concluding phrase "or must meet such alternative requirements for waste classification and characterization as DOE may authorize." The NRDC argued that the DOE Order conflicted with the NWPA definition of HLW and the concluding phrase gave DOE unfettered discretion to reclassify any HLW as "incidental waste."

Judge Winmill ruled that "DOE had violated the NWPA by promulgating Order 435.1 as it relates to incidental waste, and that portion of Order 435.1 is declared invalid." He also said that DOE does not have the discretion to dispose of defense HLW somewhere other than a repository established under NWPA. This judgment has been appealed by DOE and they are also trying for a legislative reversal.

The waste in the 251 HLW tanks at Hanford, SRS, and INEEL is by definition HLW. The court clearly stated:

"It is undisputed that the waste at Hanford, INEEL, and SRS is highly radioactive and the result of reprocessing. No solids have yet been extracted from the liquid waste at those sites and treated to reduce fission products. Thus the waste at issue in this case falls within NWPA's definition of HLW. (Memorandum Decision, July 2, 2003, p.11)"

Therefore DOE must remove the HLW from the tanks and treat it in a form suitable for final disposal in a repository. The Court's opinion did not prohibit DOE from creating a variety of types of solid wastes after treating the HLW extracted from the tanks. High activity solid waste must be sent to a HLW repository, but HLW liquids could potentially be reclassified. The Court did not address the question of what entity is ultimately responsible for a reclassification decision.

Dr. Cochran summarized the CH2M Hill arguments concerning the 12 tanks at Hanford:

1. The plutonium concentration process is not an integral part of the chemical separation process (i.e. reprocessing);

2. Building 224-T and 224-B were not an integral part of the T- and B-Plants. Therefore these buildings were not part of the reprocessing which occurred in Buildings 221-B and 221-T; and;

3. Waste leaking from first cycle solvent extraction process and wastes from decontamination of first cycle solvent extraction processing equipment are not HLW.

Dr. Cochran disagreed with each of these claims because all of these tanks appear to contain some raffinate from reprocessing.

In Dr. Cochran's opinion, Judge Winmill's opinion does not preclude waste from the 12 tanks from going to WIPP if it is first removed from the tanks, treated to reduce its fission product content and solidified. He recognizes that the waste would have to meet the WIPP waste acceptance criteria.

Detwiler asked if Judge Winmill's decision necessarily applied to all the tanks. Cochran believes it does and that all of the tanks are considered HLW. Some speakers tried, inconclusively, to connect the radioactivity concentrations of waste fractions separated out of the tank waste as a means of classifying TRUM rather than origin and contamination with HLW.

f) David Bartus, U.S. Environmental Protection Agency

Dr. Bartus stated that the perspective of the US Environmental Protection Agency, Region 10 was consistent with that of the Washington State Department of Ecology and was effectively summarized by Susan Dahl. Region 10 is interested in technically viable proposals for the tank wastes and will remain engaged in discussions concerning these proposals. He recognized the complexity of this issue and expressed a concern about rushing into an early decision that could, for example, result in waste being "orphaned" in Washington State. Dr. Bartus emphasized that Region 10 was not a decision maker in the determination of waste classification in the tanks. He believes that the key issue is whether the uranium separation phase is defined as fuel reprocessing.

In response to a question, Dr. Bartus declined to speculate on whether the wastes in the 20 tanks were TRU or HLW. Also, he offered no opinion about the classification of a waste where TRU and HLW was mixed.

5. References:

"DOE's Evaluation of Whether Some Tank Wastes Meet the Requirements for Disposal at WIPP: An Overview", Paul Detwiler, DOE (Handout)

"Hanford Tank Waste", Suzanne Dahl, State of Washington Department of Ecology (Handout)

"Origin of Waste in Selected Hanford Single-Shell Tanks", Dr. John Kristofzski, CH2MHill and Mr. Robert Yasek, DOE (Handout)

"Department of Health and High-Level Waste at Hanford", Allen Conklin, State of Washington Department of Health (Handout)

"Potential Disposal at WIPP of Materials Contained in High-Level Radioactive Waste Tanks", Dr. Thomas Cochran, Senior Scientist, Natural Resources Defense Council (Handout)

"Role of EPA", Mr. David Bartus, Region 10, U.S. Environmental Protection Agency (No handout, notes were taken of his presentation)

For the discussions presented in this Report, notes of the discussions were used to reconstruct highlighted items.