UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

JAN 15 1991

MEMORANDUM FOR: P. Lohaus, Chief
Low-Level Waste Management Branch
Division of Low-Level Waste Management
and Decommissioning

THROUGH: M. Tokar, Section Leader
Low-Level Waste Management Branch
Division of Low-Level Waste Management
and Decommissioning, NMSS

FROM: Mary Thoma Adams, Civil Engineer
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SUBJECT: MEETING AT WEST VALLEY DEMONSTRATION PROJECT (WVDP)
DECEMBER 18, 1990

The meeting started at about 8:30 am and was attended by representatives of the Nuclear Regulatory Commission (NRC), West Valley Nuclear Services (WVNS), New York State Energy Research and Development Agency (NYSERDA), Department of Energy (DOE), Dames and Moore, Southwest Research Institute Center for Nuclear Waste Regulatory Analysis, and Brookhaven National Laboratory. A list of the morning meeting attendees is attached.

The purpose of the meeting was to familiarize the NRC with WVDP's plans for washing the sludge layer in Tank 8D-2 and for management of the resulting sludge wash waters. The wash waters will be treated in the same systems as the tank supernatant has been treated, including ion exchange to remove Cs-137 and plutonium, evaporation to 33 wt% solids, stabilization in cement, and storage in the drum cell. The ion exchange resins and other media (such as sand filters) will be mixed with the washed sludge and the thorex waste from Tank 8D-3 and vitrified into glass logs. The vitrified logs will be high-level waste and will be stored on site until a permanent repository is available.

Mark Schiffhauer (WVNS) discussed the structure of Tank 8D-2 and the challenges facing the sludge wash project, mostly the effort to sample and characterize the sludge layer and then to physically mobilize the sludge layer with pumps and wash water. Mr. Schiffhauer also compared the radiochemistries of the supernatant and the expected sludge wash. This discussion and the data were based on laboratory scale washing of sludge samples.

The purpose of the sludge wash is to remove sulfate salts from the sludge, i.e., salts that will interfere with the vitrification process. The sludge will be washed with utility water that has been adjusted to a high pH with NaOH. The purpose of the pH adjustment is to inhibit the solubilization of plutonium and uranium into the wash water, keeping it in the sludge and out of the low-level waste forms.

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Mr. Schiffnauer and other later speakers also discussed WVDP's schedule for performance of the qualification testing and for beginning the production phase of the sludge wash. WVDP would like to begin the actual sludge washing in July 1991. Therefore, they want NRC endorsement of the process prior to that date.

However, WVDP's schedule shows that low-level waste form recipe qualification testing will not be completed until after that date. The time shown on their schedule for TR/PCP development occurs before the qualification testing is completed, indicating that these documents will be prepared without final data.

After this discussion, Robert Lawrence (WVNS) guided a tour of the supernatant treatment process, including the tank farm and hot cell, the Supernatant Treatment System (ionization columns) control room, the Liquid Waste Treatment System (evaporator) and Cement Solidification System (CSS) control rooms, and the drum cell. We also drove past the two disposal areas and looked at the leachate interceptor trench at the NRC licensed disposal area.

During lunch we were shown videos of the sludge mobilization experimentation in the scale model tank and the sludge wash laboratory scale testing. Mr. David Fauth (WVNS) described the sludge core sampling and analysis and compared the wash compositions between the utility water and the high-pH water and among the four sequential washes. He also discussed the performance of the titanium-zeolite in removing plutonium.

Frank Hara discussed the chemistry of the 33 wt% CSS feeds and the comparison among four successive washes. His conclusions were that the proportions of nitrite, nitrate, sulfate, and sodium salts in the evaporated wash are very similar for subsequent washes, indicating that the same cement recipe would work for all four washes. Mr. Hara also discussed the modification of the supernatant cement recipe to compensate for the additional salts expected to be in the sludge wash. Mr. Hara discussed the plans for cement recipe compressive testing, immersion testing, thermal cycling stability, biodegradation testing, radiation testing, and leach testing, using simulated waste.

The testing that has been performed so far was based on sludge samples taken in 1989. Core samples were taken of the sludge layer at four locations around the tank. Ten small segments of Core #1, distributed along the core from top to bottom, were analyzed individually for ionic species. The remainder of Core #1 and the other three cores were analyzed individually for free liquid and weight percent solids, then mixed into one composite sample. This composite was analyzed for the same ions as the Core #1 segments.

The composite sample was then washed with plant utility water to flush out the sulfate in the sludge. This wash was found to mobilize plutonium (Pu) and uranium (U) in concentrations too high for the final low-level waste form. In order to attempt to keep the Pu and U insoluble, the next wash test was performed with water at pH=10; this wash still solubilized too much Pu and almost all of the U. The third wash test was performed with water at pH=12; this wash resulted in acceptable U concentrations and Pu concentrations that could be treated in the titanium-coated zeolite columns.

Although this sludge wash testing appears to be well designed, it is important to note that the conclusions are based on a single composite sample. Assumptions of sludge uniformity across the layer are based on similarities in free liquid and weight percent solids only; no chemical comparisons are possible with the data generated so far. The segment data from core #1 indicate that the layer is not chemically homogeneous in the vertical dimension.

The next step of the testing program focused on the performance of the titanium-coated zeolite in removing plutonium from the pH-12 wash. The testing concluded that the Ti-coated zeolite is effective in further reducing the Pu concentration of the wash without reducing the Cs-137 removal effectiveness.

Process testing using washes of the actual sludge ended at this point. All testing of the cement solidification process will be performed on simulated sludge wash, consisting of tank 8D-2 supernatant spiked with nitrite, sulfate, and sodium hydroxide, and evaporated to 33 wt% solids. The sludge wash will be cement solidified at 33 wt% instead of the 39 wt% used for the supernatant, because of the higher sulfate content in the sludge wash. Compressive testing will be performed on 2-inch cubes and cast cylinders in accordance with ACM-CUBE-4801 Rev.5 and ASTM C-39, respectively. Immersion stability, thermal cycling, biodegradation testing, and radiation stability testing will be performed on cores from six full-scale single-mix batch test drums. Leach testing will be performed on cast 1-inch diameter cylinders per ANS 16.1.

It appears from this presentation by Mr. Frank Hara that no cement solidification testing of actual sludge wash will be performed prior to full production, and that the cement recipe qualification will be based on data from a very small number of tests performed on the simulated sludge wash. Experience at West Valley and elsewhere has shown that behavior of cement-stabilized waste forms is very difficult to predict based on simulations, and that full-scale testing of the waste form using actual waste is essential to assure successful stabilization. West Valley's schedule does not provide for actual waste form testing prior to full production. It also does not allow for any failures of the simulated waste forms, and the time required to modify and retest the cement recipe.

Mike Tokar of NRC then discussed the importance of performing the testing on actual waste and waste forms instead of on simulated waste. Although the simulated sludge wash used in the cement testing appears to be a reasonable simulation, final qualifications testing needs to be performed on actual waste. There are two distinct criteria for the cement form stability, one is initial setting and the other is long-term performance. The presence of organics in the sludge at unknown concentrations can affect the setting, and the presence of sulfate and aluminum can affect long-term concrete stability. Both of these concerns are being considered, but it must be emphasized that the performance testing program must include both these criteria for actual waste. It is also important to consider the relationship between the Topical Report (TR) and the Process Control Program (PCP) plan, in that the PCP should assure that the waste form quality demonstrated in the TR will consistently be met during production.

Dr. Tokar distributed and discussed Revision 1 of the Technical Position on Waste Form (TPWF), and made it clear that NRC will evaluate the sludge wash Topical Report against the revised TPWF. He noted that West Valley (C.W. McVay, J.R. Stimmel, S. Marchetti) participated in the 1989 Workshop on Cement Stabilization, and much of the revised Technical Position is based on the information presented at that workshop. Detailed information on West Valley cement stabilization was also obtained during NRC's review of the decontaminated supernatant stabilization program.

The schedule proposed by WVDP for testing and approval of the sludge wash plan appears to be excessively ambitious at best. The Division has committed about 0.3 FTE to the West Valley project; however, it is not certain that NRC can accommodate the proposed schedule, especially since the information and data will be submitted in bits and pieces over the next several months.

R. Lawrence asked what WVDP could do to make the TR approval process as smooth and fast as possible; NRC agreed to accept monthly reports and submittals and frequent telephone conversations and meetings.

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SUBJECT ABSTRACT: MEETING AT WEST VALLEY, NY, DECEMBER 18, 1990

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