Many Voices Working for the Community

Oak Ridge
Site Specific Advisory Board

July 15, 2004

Mr. Steve McCracken
Assistant Manager for Environmental Management
DOE-Oak Ridge Operations
P.O. Box 2001, EM-90
Oak Ridge, TN 37831

Dear Mr. McCracken:

Recommendation on the Proposed Plan for the Amendment of the Record of Decision for Interim Actions for the Melton Valley Watershed at the Oak Ridge National Laboratory, Oak Ridge, Tennessee: Revised Remedial Action for Seepage Trenches 5 & 7

At our July 14, 2004, meeting, the Oak Ridge Site Specific Advisory Board approved the enclosed recommendation.

We appreciate your consideration of our recommendation and look forward to receiving your written response.

Sincerely,

David N. Mosby, Chair

Enclosure

cc/enc: Dave Adler, DOE-ORO
Pat Halsey, DOE-ORO
Connie Jones, EPA Region 4
John Kubarewicz, BJC
John Owsley, TDEC
Ed Trujillo, BJC
Sandra Waisley, DOE-HQ

P.O. Box 2001, EM-91, Oak Ridge, TN 37831 • Phone 865-241-4584; 1-800-382-6938 • Fax 865-576-5333
Web: http://www.oakridge.doe.gov/em/ssab

Oak Ridge Site Specific Advisory Board Recommendation on the Proposed Plan for the Amendment of the Record of Decision for Interim Actions for the Melton Valley Watershed at the Oak Ridge National Laboratory, Oak Ridge, Tennessee: Revised Remedial Action for Seepage Trenches 5 and 7

BACKGROUND

The Melton Valley Record of Decision (MV ROD) was signed September 21, 2000 by the Department of Energy (DOE), Environmental Protection Agency (EPA), and Tennessee Department of Environment and Conservation (TDEC). The MV ROD specifies a remedial action for each contaminated unit in the valley to protect human health and the environment. The remedial action specified for Trenches 5 and 7 was in situ vitrification (ISV). The ROD process also evaluated but did not select in situ grouting.

In May 2004, DOE issued a *Proposed Plan for the Amendment of the Record of Decision for Interim Actions for the Melton Valley Watershed at the Oak Ridge National Laboratory, Oak Ridge, Tennessee* (DOE/OR/01-2164&D1). According to the plan, substitution of in situ grouting for ISV in the MV ROD will (1) be protective of human health and the environment; (2) comply with Applicable Relevant and Appropriate Requirements; (3) be cost-effective; (4) utilize permanent solutions and alternative treatment technologies to the maximum extent practicable; and (5) satisfy the preference for treatment as a principal element of remediation. A public meeting regarding the proposed plan was held on June 16, 2004.

The purpose of this proposed plan is threefold: (1) to examine a proposal to change the treatment of Trenches 5 and 7 from ISV to in situ grouting; (2) to describe the in situ grouting approach, advantages, disadvantages, and cost; and (3) to provide an opportunity for public comments on the proposal to change treatment.

Seepage Trenches 5 and 7 are located 800 ft apart along separate ridge lines north of White Oak Creek. Trench 5 is 300 ft long; Trench 7 was constructed in two 100-ft sections. Both trenches currently are covered with an asphalt cap.

Seven seepage pits and trenches were used for the disposal of liquid low-level waste (LLLW) from 1951 to 1966. As generated, these wastes contained high concentrations of acid. Prior to transfer to the seepage trenches, they were chemically treated in the LLLW storage tanks and adjusted to a pH of 12 or greater. The LLLW treatments were designed to enhance precipitation of strontium and other radionuclides from the waste solution and to improve their sorption in soil. Also, the seepage pits and trenches were excavated in clayey soils to take advantage of the clay’s low permeability and high sorption capacity.

The trenches were excavated to a nominal depth of 15 to 16 ft, with a 3-ft wide base and outward-sloping sides. Several vertical, perforated corrugated metal standpipes were installed along the centerline of the trench for radiation monitoring and liquid sampling. An approximate 10-ft-thick layer of 1 ½- to 2-in. size crushed limestone was placed in the trenches to allow for percolation. Horizontal LLLW distribution lines were installed at a slight slope along the centerlines of the trench and buried beneath the top surface of the crushed limestone. The remainder of the trench was backfilled to the surface with soil.

Within the trenches, the LLLW flowed through gaps between the joints of the distribution pipelines and then over the 10 ft of crushed limestone. The highest concentrations of radionuclides generally accumulated at the interface between the crushed stone and the bottom of the excavated trench. Approximately 18 million gallons of liquid waste were disposed in Trenches 5 and 7.

The trenches are now 40 years old, and any readily soluble radionuclides have long since migrated away from the trench areas. The remaining trench waste is relatively immobile. Fission products and actinides are insoluble in form or are absorbed by clay minerals and oxides in the soil. Almost all of the residual contamination is believed to be located within the trench or within the first few inches of surrounding soil. The current inventories for Trenches 5 and 7 are approximately 138,000 and 122,000 curies, respectively, and predominantly due to the approximately 30-year half-lives of cesium-137 and strontium-90. This represents less than 40% of the original inventory and is expected to drop to less than 1% of the current activity within 200 years, after which institutional controls consistent with the MV ROD will remain in effect for overall risk.

Surface water sampling shows that contributions to surface water risk are negligible and could remain negligible for hundreds of years. Any remedial action for the trenches assures that the potential for future releases remains low.

A full-scale ISV demonstration was conducted at Seepage Pit 1 at Oak Ridge National Laboratory in the spring of 1996. On April 21, after 17 days of ISV operation, approximately 20 tons of radioactive molten glass was expelled from the pool of molten soil. The cause of the expulsion was that a significant bubble of steam had formed beneath the molten body and moved upwards. Contributors to the event included the saturated soil conditions and a two-day, 1-in. total rainfall event approximately 24 hours prior to the expulsion event.

Despite advances in ISV technology, including a planar melting configuration for attainment of deeper or narrower melts and special applications involving high concentration of gas-generating materials, new information learned in preparation for ISV design and implementation prompted a reassessment of the remedy. The new information included the presence of standing (perched) water in the trenches and a much higher-than-expected cost for performing ISV ($55M vs. $27M in ROD estimate).

In the in situ grouting approach, the trenches would be treated by a low-pressure permeation grouting method, using Portland cement-based grouts. Soil adjacent to the trench walls would be treated with a solution grout (e.g., polyacrylamide) to seal off seepage pathways. Baseline monitoring would occur prior to grouting.

Both ISV and in situ grouting are implementable in Trenches 5 and 7. Whereas ISV is acknowledged to be highly permanent, in situ grouting should be effective for hundreds of years, according to DOE. Worker risk for in situ grouting is manageable compared to the potential risk from melt expulsion from standing water for ISV. Both technologies can be implemented, but in situ grouting is widely used in comparison with a sole vendor for ISV. Cost of in situ grouting is estimated at $14M versus $55M for ISV.

DISCUSSION

Prior to preparation for the ROD amendment, the Oak Ridge Site Specific Advisory Board (ORSSAB) went on record at its April 14, 2004, meeting to recommend that DOE prepare an Explanation of Significant Difference (ESD) to document the change in remediation of Trenches 5 and 7 from ISV to in situ grouting. The ESD should address how grouting will be as protective of human health and the environment as ISV, and the ESD should defend statements of cost and schedule referenced in a draft fact sheet provided to the ORSSAB Environmental Management Committee on February 18, 2004. The ESD should also address the following issues:

- What additional treatability studies will need to be performed?
- Will there be any changes in the quantity of soils processed by using in situ grouting?
- Why was in situ grouting not selected as the preferred remediation strategy in the ROD if it is as protective as and more cost-effective than ISV?

ORSSAB further recommended that DOE fully consider ORSSAB, EPA, and TDEC concerns relating to long-term stewardship issues that may be associated with the shift from ISV to in situ grouting.

The development of the proposed plan for the ROD amendment and its presentation satisfy in more formal manner the public involvement process envisioned to accompany an ESD.

The substitution of ISV for in situ grouting, while it may be effective for the period of concern, appears to be more dependent on details of design and implementation to achieve the success and manageable worker risk than is predicted. No information unfavorable to the proposed substitution of technology is presented in the proposed plan. To raise and then discount some unfavorable information about in situ grouting would result in a more balanced presentation.

Two examples illustrate this point.

A literature review identified an event that resulted in a Type B accident investigation at Idaho National Engineering and Environmental Laboratory (INEEL) on October 15, 2001. A subcontractor operator of a grout injection rig received serious head injuries and required hospitalization when he was struck by flying debris from a failed fitting assembly. The accident investigation board concluded that the direct cause of the accident was a failure of a 45° swivel elbow that was underrated for the system in which it was used. The rated working pressure was 3,000 psi, and the high-pressure grouting operation had a normal working pressure of 6,000 psi. [REFERENCE: U.S. Department of Energy, *TYPE B Accident Investigation Board Report Grout*

Injection Operator Injury at the Cold Test Pit South, Idaho National Engineering and Environmental Laboratory, October 15, 2001, DOE/ID-10968, Idaho Operations Office, November 2001.]

Although the proposed remedy substitution is characterized as “low-pressure” permeation grouting, reasonable questions may be raised about the required working pressure to accomplish the remediation objectives.

Secondly, a full-scale field demonstration was conducted to evaluate in situ solidification for stabilizing an inactive Resource Conservation and Recovery Act land treatment site at a DOE facility in Ohio. Despite previous site-specific treatability experience, there were difficulties in selecting a grout with the requisite treatment agents amenable to subsurface injection and at a volume adequate for distribution throughout the mixed region while minimizing volume expansion. Grout distribution within the mixed region was not uniform, and the hydraulic conductivity of the solidified soil was greater than that of the undisturbed natural deposit. [REFERENCE: Siegrist, R.L., Cline, S.R., Gilliam, T.M., and Conner, J.R, “In-Situ Stabilization of Mixed Waste Contaminated Soil,” Stabilization and Solidification of Hazardous, Radioactive and Mixed Wastes, ASTM STP 1240, T. Michael Gilliam and Carlton C. Wiles, Eds., American Society for Testing and Materials, Philadelphia, 1995.]

Finally, ISV and in situ grouting have been undergoing evaluation as alternatives for application at the Subsurface Disposal Area of the Radioactive Waste Management Complex at INEEL. Administrative Record technical documents are posted electronically at http://ar.inel.gov soon after release, and their availability in that format greatly facilitates dissemination and use to support in-depth review.

RECOMMENDATION

ORRSAB supports the substitution of in situ grouting for ISV as the remedial action for Trenches 5 and 7 in the Melton Valley Record of Decision.

We are concerned that special attention be provided to design and implementation details. This is justified by a conceivable failure of the technology to perform as predicted and the implementation should reflect complex-wide experience and lessons learned. Adequate monitoring and rigorous criteria for interpreting monitoring results are critical for early detection and identification of post-remedy failure.

ORSSAB requests that the proposed plan be strengthened in the areas that are intended to address the issues raised in the April 14, 2004, ORSSAB recommendation.

ORSSAB additionally recommends that DOE make available electronically Administrative Record file documents and other information pertinent to decisions such as this so that the information may be readily shared among stakeholders and others they may wish to consult.

Finally, ORSSAB would like to be fully informed of any concerns or reservations that EPA and TDEC may have with substitution of in situ grouting for ISV as the remedy.