SRS Citizen's Advisory Board

Recommendation No. 96

September 28, 1999

Independent Scientific Peer Review Selected Subsurface Remediation Activities
Savannah River Site

Background

Solvents were used in degreasing operations in the Savannah River Site (SRS) fuel fabrication facility in M-Area near the northern border of SRS. Most of these solvents evaporated but in 1981 measurements showed that solvents were also contaminating the subsurface soil and groundwater from M-Area discharges to a stream and a seepage basin. Smaller discharges of solvents to the environment also came from A-Area. The groundwater contamination from both A and M-Areas underlies A Area. By the mid-1980s, remediation activities had begun removing the volatile organic solvents from the unsaturated soil and the groundwater.

In 1999, Dr. Joel Massmann, University of Washington, was funded by the CAB to conduct an Independent Scientific Peer Review (ISPR) of the A/M Area cleanup. The CAB already had passed recommendations dealing with contamination in the A/M and F/H-Areas (Ref. 1 and 2). Dr. Massmann performed an ISPR of the F&H areas in 1995 and now has prepared an ISPR report primarily on A/M-Area with an update on Phase I of the F&H Area cleanup located near the center of SRS.

Closure of the F-and H-Area seepage basins occurred during the late 1980s. Phase I involved constructing groundwater extraction and treatment for the metals and a re-injection system to delay the release of tritium to the Four Mile Branch stream. Phase I was scheduled for three years in order to build an operational data base that would provide the criteria to operate during a longer Phase II. However, as a result of many technical difficulties, Phase I has yet to provide sufficient data.

Conclusions from the ISPR draft report (Ref. 3) and its public review are:

1. The estimate of the amount of solvent discharged to the ground (3.6 million pounds) is uncertain due to possible errors in estimating evaporation loss.

2. Measurements of solvents in the soil and groundwater are insufficient to provide an estimate of the total amount of organic contaminants in the subsurface environment.

3. Statements regarding the amount of time required to clean the soils and the groundwater are speculative.

4. The approach used to estimate the radius or zone of influence for vapor extraction wells is overly simplified. It assumes horizontal, one-dimensional flow and neglects the importance of layering and the 3-dimensional geometry of the soil.

5. The rationale for setting clean up goals has not been clearly established between the three agencies. For Soils less than 80 feet deep, the goal is 700 parts per billion in water (ppbw) and for soils greater than 80 feet deep, it is 56 ppbw. Both are above the drinking water standard of 5 ppbw.

6. Estimates of soil vapor removal rates from the vapor extraction systems (350,000 lbs) have been validated.

7. Estimates of soil vapor removal rates (330 lbs over the past 3 years at a cost of about $195,000) as a result of barometric pumping have not been validated.

8. The tests with re-circulation wells in the A/M Area have not yet provided sufficient data on the radius of the zone of influence as a function of pressure drops or flow rates, nor has the effectiveness of these wells been validated.

9. Since 1985, the pump-and-treat system has removed about 530,000 lbs of solvent from 3.5 billion gallons of water treated, but the system's future removal rate is projected to be flat.

10. The total solvent removed from the A&M area since 1985 is an estimated 880,000 lbs out of the estimated 3.6 million pounds of solvent in the soils and groundwaters (about 24%).

11. The F and H Area groundwater treatment system Phase I appears to be operating satisfactorily now.

Recommendation

The SRS CAB recommends that DOE:

A&M Area:

1. Perform additional characterization of subsurface solvents, particularly in the vicinity and beneath processing facilities (313, 320 and 321 M), the shallow soils, and the M-Area settling basin.

2. Use three-dimensional flow models to evaluate flow patterns in the vicinity of vapor extraction wells.

3. Evaluate the flow rates and effectiveness of solvent extraction wells.

4. Optimize the operational costs of the vapor extraction wells by adjusting flow rates from the less-efficient to the more-efficient wells.

5. Evaluate the flow rates and effectiveness of barometric pumping.

6. Determine the zone of influence and effectiveness of the re-circulation wells in the A/M Area.

7. Determine the effectiveness of pump-and-treat for the groundwater in the A/M area, and provide an estimate of the time necessary to complete the pump-and-treat operation.

8. Based on information obtained from 1 – 7 above, and in an open process with the regulators and public, and facilitated by ISPR, establish soil and groundwater concentration cleanup goals for the A&M Area and an estimate of the time and costs to achieve those goals.

F&H Area:

9. For the F&H-Area groundwater treatment system, determine the feasibility of precision pumping.

10. For the F&H Area, collect additional data to improve the characterization of contaminant sources.

11. Based on 9 and 10, in an open process with the regulators and public, facilitated by ISPR, establish cleanup goals for the F&H groundwater treatment system and an estimate of the time to achieve those goals.

Both A&M and F&H areas:

12. Provide annual briefings of soil and groundwater corrective actions to the CAB and the public.

13. DOE should explore the possibility of continued technical advisory support in the form of an ISPR.

References

1. CAB Recommendation 3, ISPR of Groundwater Remediation Technologies in A/M, F and H Area, adopted 7/25/95.

2. CAB Recommendation 9, Implementation of the F&H Groundwater Remediation Project, adopted 9/26/95.

3. Draft final Report, Independent Scientific Peer Review, Selected Subsurface Remediation Activities, Savannah River Site, prepared by Joel Massmann, [drafted August 15, 1999].

Agency Responses

Department of Energy-SR
Department of Health and Environmental Control