ENVIRONMENTAL ANALYSES FOR SAVANNAH RIVER PLANT WASTE MANAGEMENT ACTIVITIES

John R. Jansen
Savannah River Operations Office
U.S. Department of Energy
Aiken, South Carolina 29808

ABSTRACT

The Savannah River Plant (SRP) has been a major installation of the U.S. Department of Energy (DOE) for the production of nuclear materials for national defense since the 1950's. Activities at SRP include fuel and target fabrication, reactor operations, fuel reprocessing/material recovery, and waste management activities. DOE is preparing analyses of the environmental impacts of ongoing and planned waste management activities for hazardous, low-level radioactive, and "mixed" wastes.[a] The purpose of these analyses is to provide a comprehensive framework in which to evaluate future waste management activities, especially as these activities relate to the protection of groundwater resources. This paper provides an overview of planned waste management actions and the strategy and methodologies being used in preparing environmental impact analyses for these proposed activities.

DESCRIPTION OF PLANNED WASTE MANAGEMENT ACTIONS

Because of previously acceptable industrial waste management practices conducted at some SRP sites (e.g., the use of seepage basins and the disposal of wastes in other unlined facilities), shallow groundwater in the vicinity of several waste sites has become contaminated with materials such as volatile organics, nitrates, heavy metals (e.g., lead, cadmium, and mercury), pesticides, and radionuclides. Some modifications of previous waste management practices have been made. Further actions will be required at some waste sites to ensure continued environmental and human health protection and to comply with applicable groundwater protection requirements [such as those of the Resource Conservation and Recovery Act (RCRA) and counterpart State of South Carolina requirements]. Continued operations and planned remedial actions at other facilities will also require the construction of new waste storage/disposal facilities. In addition, alternatives for the continued management of filtered, deionized reactor disassembly-basin water discharges, which contain some tritium, are also being analyzed.

DESCRIPTION OF WASTE MATERIALS AND SITES

SRP operations result in the generation of a variety of sanitary, solid, and radioactive waste materials. Waste materials are generated during each step of the fuel cycle process and in supporting activities. Hazardous wastes such as spent degreasing solvents are generated during the fabrication of fuel and target elements; low-level radioactive job control wastes are generated during reactor, chemical reprocessing, and laboratory operations; and mixed wastes are generated in laboratories and in waste management activities.

One hundred and sixty-eight SRP sites have received wastes. Many of these waste sites (e.g., the sanitary landfill and construction rubble pits and piles) present limited environmental hazards. However, there are also 77 sites that receive or may have received wastes or hazardous and/or low-level radioactive constitutents. Most of these 77 waste sites are in or adjacent to an SRP production area.

ENVIRONMENTAL IMPACT METHODOLOGY: STRATEGY DEVELOPMENT

Alternative strategies are being developed for modifications of SRP waste management activities for hazardous, low-level radioactive, and mixed wastes to ensure the continued protection of groundwater resources, human health, and the environment. Implementation of project specifications will be determined through the regulatory process. An environmental impact statement (EIS) is being prepared by DOE to assess the environmental consequences of the alternative strategies. The alternative modification strategies differ in terms of:

- The concepts/designs proposed for closure/remedial actions at existing waste sites, the construction of new disposal facilities, and the continued discharge of disassembly-basin purge water.
- The degree to which land area dedication is required.
- The degree of periodic monitoring and oversight required to ensure that releases from SRP facilities are within applicable standards.

The alternative EIS strategies are reflective of DOE institutional requirements (for continued safe, environmentally sound, and cost-effective operations) and of certain legislative and regulatory mandates (e.g., RCRA and South Carolina Hazardous Waste Management Regulations). For example, RCRA reflects these differences by requiring the owner of a RCRA hazardous waste management site that is releasing waste constituents to remove and control contaminants from the soil, surface water and groundwater outside the site, or to remove the source of contamination from the site to achieve background levels or agreed-to alternative concentration limits. If the owner removes and controls the contaminants in enviromental media outside the waste site, the waste site remains dedicated to waste management; long-term monitoring and oversight are required to ensure environmental protection.

[a] "Mixed" in this paper is used as a generic (i.e., having both a radioactive and hazardous component) rather than a regulatory term.

If the owner removes the source of contamination (i.e., the waste material and the contaminated soil within the site), the site no longer needs to be dedicated to waste management purposes nor does it require long-term monitoring and oversight.

This requirement for dedicating land area for waste management purposes and committing resources for long-term monitoring and oversight is also reflected in the choice between disposing of or storing wastes. The disposal of wastes that retain their hazardous and/or radioactive characteristics requires permanent or long-term dedication and monitoring. Alternatively, the use of storage as an isolation technique implicitly assumes that research and development will provide acceptable future alternatives for treatment of stored waste before its ultimate disposal.

ENVIRONMENTAL IMPACT METHODOLOGY: ANALYZED STRATEGIES

Strategies have been developed for analysis in the EIS, which combine concepts for closure actions at existing waste sites, designs and locations for the construction of new disposal facilities, and the continued management of reactor disassembly basin purge water. The developed strategies were:

- Dedication
- Elimination
- Combination

Dedication Strategy

Under this strategy, DOE could modify waste management activities to comply with groundwater protection requirements by implementing closure and remedial actions at existing waste sites to control contamination in accordance with applicable standards, establish new disposal facilities, and continue to use seepage basins for the periodic discharge of reactor disassembly basin purge water.

If implemented, this strategy would require that DOE dedicate for waste management purposes those hazardous and radioactive contaminated areas that could not be returned to public use after a 100-year institutional control period. Releases of hazardous and mixed waste constituents from waste sites would be controlled by implementing closure actions and remedial actions as necessary to control groundwater contaminant plume migration.

Under this strategy, DOE would establish new disposal facilities at SRP. The new facilities would be used to accommodate wastes from ongoing operations, wastes in interim storage, and waste from ongoing and planned waste treatment facilities (e.g., liquid effluent treatment facility sludges).

The periodic discharge of reactor disassembly basin discharge water to seepage basins would continue. These basins, which receive the low-level liquid radioactive discharges (principally tritium), allow radioactive decay to occur before the water is discharged to surface water systems. If these basins could not be returned to unrestricted public use after a 100-year control period, they would be dedicated to waste management purposes.

Elimination Strategy

This strategy would allow DOE to modify waste management activities by removing wastes to the extent practicable from all existing waste sites and closing these sites, establishing new disposal facilities, and directly discharging disassembly basin discharge water to onsite streams or evaporating this discharge water.

Under this strategy, DOE would not dedicate any land for waste management purposes. Hazardous, low-level radioactive, and mixed wastes and contaminated soils would be removed from existing waste sites to the extent practicable. After the 100-year institutional control period, these sites could be used for purposes other than waste management.

DOE would store wastes from ongoing operations and from waste site closure and removal actions in facilities from which they could be retrieved. Hazardous and mixed wastes already in storage would remain in facilities from which they could be retrieved. DOE would continue its research on new waste disposal technologies for the eventual disposal of the stored wastes.

Disassembly basin purge water could be discharged directly to onsite streams in accordance with applicable permitting requirements or the water could be atmospherically discharged through one of several evaporation processes. In either case, the seepage basins now used for the discharge of disassembly basin purge water would be eliminated and closure and remedial actions undertaken as necessary so that these sites could be used for purposes other than waste management after the 100-year institutional control period.

Combination Strategy

Under this strategy, DOE could modify SRP waste management activities by removing wastes at selected waste sites, establishing a combination of retrievable storage and new disposal facilities, and continuing the discharge of reactor disassembly basin purge water to seepage basins.

Under this strategy, waste materials and contaminated soil would be removed from selected sites based on environmental/human health risk evaluations and the cost-effectiveness of potential closure/removal actions. After the 100-year institutional control period, the sites from which waste material had been removed could be used for purposes other than waste management. Sites from which waste material had not been removed would continue to be controlled if necessary or returned to other uses following site investigations.

New SRP disposal facilities would be constructed for wastes from ongoing operations and closure/removal actions at existing waste sites. Hazardous and mixed wastes facilities would be constructed in accordance with applicable regulatory requirements. Some waste disposal facilities would be dedicated for waste management purposes following the end of their operational lifetimes.

Disassembly basin water discharges to seepage basins would continue. DOE would continue to assess the feasibility of alternative treatment methods. Following the end of the 100-year institutional control period, DOE would determine whether the seepage basin sites could be returned to unrestricted use or remain dedicated to waste management.

ENVIRONMENTAL IMPACT METHODOLOGY: DETERMINATION OF CONSEQUENCES

The determination of environmental consequences associated with the alternative strategies is based on a combination of data and analyses derived from groundwater monitoring, groundwater flow and transport modeling, waste site inventory estimations, onsite and offsite health effects modeling, ecological impact assessments, and estimates of risk to onsite occupants following the 100-year institutional control period. The EIS will provide a comparison of alternative waste management strategy including project-oriented specific actions.

The assessment methodologies in the EIS are flow and solute transport models for groundwater (particularly the PATHRAE model), atmospheric dispersion models for radiological and nonradiological constituents, and estimation of human health risks through radiological and/or chemical health risk models. Onsite worker exposures were also calculated.

SUMMARY

The DOE is considering modifications to waste management activities at SRP. As a part of its considerations, and to provide input to decisionmakers on needed modifications, an EIS is being prepared to assess the consequences of the implementation of alternative waste management strategies. The alternative waste management strategies that are being considered are dedication, elimination, and a combination of the dedication and elimination strategies.