Savannah River Site – Incorporating Risk and Land Use into Site "Area Completion" Remedial Decisions at the Savannah River Site - 11409

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ABSTRACT

This paper will describe how agreement on land use decisions early in the remedial process are essential in risk management decision making and schedule acceleration. After many decades of nuclear material production missions, the environmental management strategy at the Savannah River Site (SRS) is focused on stabilization and safe storage of nuclear materials considered excess to the weapons stockpile, disposition of highly radioactive liquid tank waste and various solid wastes, decontamination and decommission of past production-related facilities and remediation of contaminated environmental media. The land use at the SRS is industrial and is expected to remain within federal government control in perpetuity.

The SRS is one of the major sites within the United States Department of Energy (USDOE) complex that successfully incorporates risk analysis and land use into the overall closure strategy. In 2003, the USDOE, United States Environmental Protection Agency (USEPA), and South Carolina Department of Health and Environmental Control (SCDHEC) entered into an agreement to accelerate completion of the environmental management missions at SRS. As part of this agreement, the parties agreed to execute work on an area-by-area basis. Instead of reaching remedial decisions on individual waste units, groups of waste units and deactivation and decommissioning facilities within a defined industrial area footprint were combined and remedial decisions was reached for the industrial area collectively. This approach was heavily dependent on early agreement with the regulatory community and the public on the final end state. By incorporating determinations about reasonably anticipated land use and the associated risk early in the decision making process, the overall remediation investigation and remediation process was streamlined and accelerated. For this reason, the long term cleanup strategy for the SRS is dependent on both the environmental risks and future land use.

This paper describes in more detail, specific examples of how integrating risk analysis with land use agreements at SRS accelerated the remedial investigative activities, streamlined the remedial alternative selection process, and reduced regulatory documentation while accelerating project schedules and reducing overall project costs. This approach has resulted in an overall site cleanup schedule that is well ahead of earlier

projected dates. Land use considerations are currently and will continue to be essential to the remediation and closure of contaminated areas at the SRS and in the evaluation of potential future site missions.

INTRODUCTION

The Savannah River Site (SRS) occupies approximately 310 square miles of land adjacent to the Savannah River, principally in Aiken and Barnwell counties of South Carolina. SRS is located approximately 25 miles southeast of Augusta, Georgia, and 20 miles south of Aiken, South Carolina. Approximately 95 percent of the SRS is comprised of natural forest vegetation, wetlands, streams, and lakes.

SRS is owned by the United States Department of Energy (USDOE), which historically produced tritium, plutonium, and other special nuclear materials for national defense and the space program, as well as for medical, industrial and research efforts. At the present time, the SRS provides a critical role in national defense with an increased emphasis on waste management, environmental restoration, and ecological research.

More than 40 years of producing nuclear material has resulted in chemical and radioactive wastes by-products that have been treated, stored, and in some cases, disposed of at SRS. As a result of these historical disposal practices, hazardous substances, as defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) are present in a range of media at the SRS including soil, sediment, sludge, groundwater, surface water, solid waste, and debris. Today, the environmental management strategy at the SRS is to focus on stabilization and safe storage of nuclear materials considered excess to the weapons stockpile, disposition of highly radioactive liquid tank waste and various solid wastes, decontamination and decommissioning (D&D) of past production-related facilities and remediation of contaminated environmental media.

In 1981, SRS began an inventory of waste sites of which a total of 515 waste sites were ultimately identified. These waste sites range in size from a few square yards to tens of acres and include contaminated basins, pits, piles, burial grounds, landfills, tanks and associated groundwater. Initial cleanup activities were initiated by the USDOE under a federal Resource Conservation and Recovery Act (RCRA) permit in 1985. In 1989, SRS was included on the National Priorities List. The inclusion created a need to integrate the established RCRA investigative program with the CERCLA requirements to provide for a focused environmental program. In 1993, the USDOE signed a Federal Facilities Agreement (FFA) [1] with the United States Environmental Protection Agency (USEPA) and the South Carolina Department of Health and Environment Control (SCDHEC) to coordinate remedial activities at SRS as one comprehensive strategy that fulfills these dual regulatory requirements.

LAND USE AND RISK ANALYSIS IN REMEDIAL DECISION MAKING

Remediation under RCRA and CERCLA is designed to mitigate risk to human health and the environment. Through the terms of the FFA, the USDOE, USEPA, and SCDHEC utilize an investigative process that integrates and combines the RCRA correction action process with the CERCLA remedial process to determine the actual or potential impact of releases of hazardous substances in the environment. This impact is measured in terms of environmental risks and hazards to a known or assumed receptor and is dependent on the exposure assumptions and reasonably anticipated land use.

Risk is a function of toxicity and exposure. Exposure is the result of the presence of a complete exposure pathway between the receptor and the contaminant and is affected by a number of factors including the type of contaminants, concentrations at the point of exposure, and the exposure pathway. An additional factor that has a significant impact on exposure is the land use. Because land use affects receptor behavior and behavior determines exposure, land use assumptions are a key factor in determining the final remedial decision for a waste unit.

To identify the contaminants and exposure pathways that need to be addressed by the cleanup decision, a baseline risk assessment is used to estimate the environmental risk or hazard at the waste unit if no action were taken. A typical risk analysis uses standard USEPA risk models to estimate the risks or hazards to a receptor based on the average contaminant concentrations detected in the environmental media and the receptor exposure assumptions. The result is a dose-response relationship that enables the risk manager to estimate the risk for each receptor and support the determination of the cleanup goals for the site. All reasonably anticipated future land uses must be considered in developing cleanup goals. For example, residual contaminants may remain at a waste unit in higher concentrations if the land use for the area is based on an industrial setting as compared to the more conservative cleanup goals that would be required to meet residential or unrestricted land use. An assumption of unrestricted land use for a site could result in cleanup goals that are biased toward treatment or complete removal. For these reasons, remedial decisions for a site and comprehensive land use planning are not independent of one another.

The land use at most USDOE sites is industrial and restricted for residential use. At waste sites that are currently industrial and will remain under USDOE control in perpetuity, a complete cleanup to allow unrestricted use is often not cost effective or necessary to manage the residual contaminants. In many cases, land use restrictions are just as effective in protecting human health and the environment as active remediation. By incorporating determinations about reasonably anticipated land use and the risk inherent in them early in the decision making process, the overall remediation investigation and remediation process may be streamlined and accelerated. For this reason, the long term cleanup strategy for the SRS is dependent on both the environmental risks and future land use.

LAND USE AND AN ACCELERATED CLEANUP VISION

In May 2003, the USDOE, USEPA, and SCDHEC entered into a memorandum of agreement to accelerate completion of the environmental management missions and transform SRS to a site focused on National Security and alternative energy. As part of this agreement, the parties initiated a process of redefining the strategic approach to cleanup based on a concept of executing work on an "area basis" [2]. This area concept manages the risk from all relevant contaminant sources and releases within an industrial area, including RCRA/CERCLA waste units and building remnants and facilities. Historically, SRS environmental restoration and deactivation and decommissioning of facilities were independent of one another.

Adoption of this site wide area cleanup strategy was largely based on agreement by the three parties on the future land use. Agreement that land use would remain industrial for these major areas allowed risk management decisions to be focused on a limited number of remedial alternatives. In place of evaluating and reaching remedial decisions on individual waste units, groups of waste units and deactivation and decommissioning facilities within the defined industrial area footprint were combined and a remedial decision was reached for the industrial area. By focusing the final remedial decision on a defined end state, significant economies of scale were realized by combining remedial investigative activities, technical analysis, and streamlined documentation on an area-by-area basis.

The early action decision for the five reactor facilities at SRS is an example of how regulatory and public agreement on future land use impacts remedial decision making. In 2007, the USDOE, USEPA, and the SCDHEC agreed that cleanup of the P-Reactor Building to unrestricted land use was not cost effective or technically achievable. An agreement was reached to maintain the land use at P-Area as industrial and the three parties signed an Early Action Record of Decision selecting in-situ decommissioning as the final remedial action for the reactor facility. Multiple public workshops were held and public comment and involvement was sought before moving forward with the implementation of the remedial action to grout the reactor vessel and portions of the building and manage the residual contamination with land use controls. Due to the wide acceptance of the early action decision for P Area, an early action decision to select in-situ decommissioning for the remaining reactor facilities at SRS including C-, K-, L-, and R-Area was reached. By agreeing early in the process that these industrial areas did not need to focus on a cleanup strategy to support unrestricted land use, the investigation activities and documentation steps were significantly reduced and only those remedial alternatives to support the in-situ decommissioning final end state were considered. Significant economies of scale were realized and the overall project schedule was reduced by more than 35 percent.

CONCLUSIONS

With USDOE's focus on accelerating cleanup and eliminating risk, SRS is concentrating on reducing the acreage footprint that will require long term management. Many SRS

facilities are no longer needed due to changes in site missions, and the USDOE faces a challenge to maintain these facilities in a safe, low cost condition until they can be safely disposed. The SRS area completion strategy [2] to focus the closure of entire industrial areas, one at a time, was highly dependent on agreement between the USDOE, USEPA, SCDHEC and the public on the final end state. Land use planning was instrumental in accelerating remedial investigative activities, streamlining the remedial alternative selection process, and reducing documentation while accelerating the project schedule and reducing costs.

In May 2003, the USDOE, USEPA, and SCDHEC entered into a memorandum of agreement to accelerate completion of the environmental management missions at SRS and transform SRS to a site focused on National Security and alternative energy. To date, 375 of the 515 waste sites at SRS have been closed and billions of gallons of groundwater have been treated. The cleanup schedule is well ahead of earlier dates that had been projected. Completion of cleanup of the large industrial areas of the site not only reduces the operation footprint, but allows these areas to be available for other industrial uses. The SRS currently hosts enduring National Nuclear Security Administration missions. In addition, the SRS has entered into an Interagency Agreement with the Department of Defense to allow use of site lands for military training purposes. SRS is also pursing possible use of portions of the site for the development of an Energy Park in support of the USDOE's energy independence strategic objective. Land use considerations are currently and will continue to be essential to the remediation and closure of contaminated areas at the SRS and in the evaluation of potential future site missions.

REFERENCES

1. Savannah River Site, "Federal Facility Agreement for the Savannah River Site, Administrative Docket No. 89-05-FF, United States Department of Energy, Savannah River Operations Office, Aiken, SC (1993).

2. Savannah River Site, "Area Completion Strategy for the Savannah River Site (U)", ERD-EN-2005-0084, United States Department of Energy, Savannah River Operations Office, Aiken, SC (2006).