

Environmental Implementation Plan

by

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Westinghouse Savannah River Company

Savannah River Site

Aiken, South Carolina 29808

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Chapter 7

Groundwater Protection

Chapter was compiled and reviewed by Dan Wells.

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Site Program Overview

The Savannah River Site (SRS) uses large quantities of groundwater for drinking, processing, and non-contact cooling. Continued industrial and residential growth along with additional agricultural irrigation in areas adjacent to SRS will increase the demand for groundwater. This increasing demand will require a comprehensive management system to ensure the needed quality and quantity of groundwater is available for all users. The Groundwater Protection Program and the Waste Management Program establish the overall framework for protecting this resource.

Groundwater under SRS is monitored extensively for radiological, hazardous, and water quality constituents. Groundwater quality is known to have been affected at 33 onsite locations, but none of the contaminant plumes have migrated offsite. Onsite and offsite drinking water supplies are monitored to ensure they are not impacted. The site has more than 1800 monitoring wells from which groundwater samples are analyzed for radiological and non-radiological constituents.

SRS is complying with all applicable regulations related to groundwater protection, waste treatment, and waste disposal. The existing waste storage facilities are permitted or are being permitted. Existing hazardous- and mixed-waste storage facilities are being included in the site Resource Conservation and Recovery Act (RCRA) Part B Permit. Part B permitting has been initiated for many of the planned hazardous- and mixed-waste treatment and disposal facilities.

The Savannah River Technology Center (SRTC) has an extensive effort underway to define the regional hydrogeological system. Current programs include geological sampling, groundwater monitoring, and aquifer modeling efforts to further understand SRS's hydrogeological system. SRS also will conduct studies on the quantities of water removed from aquifers relative to the production capability of the formation.

To protect the groundwater from contamination, the site has comprehensive spill prevention and waste management programs. As discussed in chapter 5, the purpose of the Spill Prevention and Control Program is to mitigate the consequences of pollutants reaching the environment and contaminating the surface waters in South Carolina. SRS's waste management program strategy requires that all waste be treated and disposed of onsite whenever practical and cost effective. Facilities to treat and dispose of radioactive, hazardous, mixed (radioactive and hazardous), and non-hazardous waste either exist, are under construction, or are planned for the near future. The Defense Waste Processing Facility (DWPF) will convert the liquid, high-level waste into a permanent, solid glass waste form for offsite, geological disposal. Low-level radioactive waste will be disposed of in the E-Area Vaults (EAV). The Consolidated Incineration Facility (CIF) will be constructed to reduce the volume of radioactive waste and to detoxify hazardous wastes. Treatment and disposal facilities for non-incinerable hazardous and mixed waste are planned. Facilities for retrieving and packaging stored TRU waste for shipment to offsite, geological storage also are planned.

Increased waste minimization activities began during FY 88. These activities focused on improved process efficiency to reduce the amount of waste generated. The strategy was to conduct a site inventory of waste streams, identify candidate streams for cost-effective reductions, and implement facility-specific reduction measures. The site will continue to reduce the amount and volume of low-level, radioactive waste going to the LLRWDF. Efforts to delist M-Area sludge from hazardous waste to nonhazardous waste will continue.

Activities toward remediating the many SRS waste units will continue to increase. The strategy is to remediate units posing the greatest perceived risk to human health and the environment, while considering regulatory risks. RCRA-closure activities have been completed on the M-Area Settling Basin, Mixed Waste Management Facility (MWMF), the F- and H-Area Seepage Basins, the Metallurgical Laboratory, and Tank 105C. In addition to waste closures, remediation activities are underway in M Area to remove chlorocarbons from the groundwater and vadose zone.

Systems to prevent and detect groundwater impacts from existing and future facilities are in place. Site specifications have been developed for underground storage tanks, diking systems, well installations, and well abandonments.

Policy

SRS's groundwater protection and waste management policy requires that site operations protect the quantity and quality of the site groundwater, meet regulatory requirements, restore the resource where degradation has occurred when practical, and comply with applicable Department of Energy (DOE) and operating contractor requirements.

Background

DOE and operating contractors are committed to protecting the public health and safety, and the environment. These convictions are stated in DOE Order 5400.1, General Environmental Protection Program, and in SRS's *Strategic Environmental Plan*. Compliance with applicable environmental regulations, DOE orders, and operating contractor policies forms the basis for SRS's groundwater protection and waste management policy.

Existing Conditions

SRS operations use large quantities of groundwater for drinking, processing, and non-contact cooling. After use and any necessary treatment, the groundwater is released to wastewater treatment facilities and surface streams or to seepage basins.

Although site operations have affected groundwater quality at several onsite locations, no offsite drinking water supplies have contaminants in concentrations approaching regulatory limits resulting from SRS operations. The impacts on groundwater quality generally have been the result of using seepage basins for wastewater disposal, atmospheric tritium discharge throughout the site's history, and non-contained waste

disposal at various units. Programs are underway to eliminate using seepage basins and to close all existing waste units. SRS operations have not affected the quantity of groundwater available to users adjacent to the site.

The increasing regional demand will require a comprehensive management system to ensure that the needed quality and quantity of groundwater is available for all users. SRS has several programs and studies underway to define and understand the regional hydrogeological cycle. The site will continue current geologic sampling, groundwater monitoring, and aquifer modeling efforts to understand further SRS's hydrogeological system. The U.S. Geological Survey (USGS) currently is conducting a multi-year study to better characterize and quantify regional groundwater flow conditions near the Savannah River. This study was funded by DOE.

SRS is in compliance with or has entered into compliance agreements related to groundwater protection, waste treatment, and waste disposal regulations. SRS is meeting consent-order requirements for groundwater monitoring and cleanup at various units. Waste treatment and disposal facilities are in compliance with federal and South Carolina regulations.

The site has a comprehensive waste management and disposal strategy. The strategy requires that all waste be treated and disposed of onsite, whenever practical. Facilities for treating and disposing of radioactive, hazardous, mixed (radioactive and hazardous), nonradioactive, and nonhazardous waste currently either exist, are under construction, or are planned for the near future. The DWPF, currently under testing, will convert 34 million gallons of liquid high-level waste into a permanent, borosilicate glass waste form for offsite, geological disposal. Low-level radioactive waste, currently disposed by shallow land burial, will be disposed of in the E-Area Vaults, which will contain the radionuclides. The site currently has permitted storage facilities for hazardous and mixed wastes. An incinerator to reduce the volume of radioactive waste and to detoxify hazardous waste is planned. Treatment and disposal facilities for hazardous and mixed waste also are planned for nonincinerable waste.

Remediation of the RCRA and RCRA Facilities Investigation/Remedial Investigation (RFI/RI) waste units, currently listed in the Federal Facility Agreement (FFA) (Appendices H and C, respectively), will be initiated or completed by the year 2020. RCRA closure activities have been completed in the M-Area Settling Basin, MWMF, the F- and H-Area Seepage Basins, the Metallurgical Laboratory, and Tank 105C. Other remediation activities are focused on characterizing, assessing, and developing remedial design recommendations for the remaining waste units as required by the site RCRA permits and the FFA.

Operations have impacted the groundwater at 33 known locations. Groundwater remediation activities are being conducted to remove chlorocarbons in the A/M Area. The chlorocarbons, used as degreasing agents in the M-Area fuel fabrication facility, entered the groundwater principally through the M-Area Settling Basin and associated underground piping. The basin was closed under RCRA, and other contaminant sources, with the exception of contaminated portions of the vadose zone, have been stopped or removed. The chlorocarbons primarily are confined in a shallow aquifer, but there are some isolated locations where the chlorocarbons have reached the deeper

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aquifer. The chlorocarbons are being removed from the shallow aquifer by a series of recovery wells installed in the plume, which remove water from the formation. The water is pumped into two air-stripper columns which remove the chlorocarbons in the water. The water then is discharged to a permitted National Pollutant Discharge Elimination System (NPDES) outfall. The chlorocarbons are stripped in a carbon filter and the remaining air is vented into the atmosphere via a permitted stack. Approximately 316,000 pounds of chlorocarbons in the formation have been removed.

The small amounts of chlorocarbons in the deeper aquifer currently pose no threat to offsite drinking water systems. SRS monitors the aquifers under A and M Areas to track existing plumes and to detect other sources. Volatile organic compounds (VOCs) also have entered the groundwater from operations near the SRTC complex. Groundwater remediation in this area began in 1992, using an air-stripper column.

The site has developed special designs and procedures to protect the groundwater from current and future operations based on Underground Storage Tank (UST) regulations. All new underground storage tanks must have double walls. New and existing underground tanks must have a rigorous inventory reconciliation procedure capable of detecting leaks. Existing above ground tanks are being retrofitted with diking systems to contain leaks. New facilities are constructed with dikes as part of the design.

Site specifications for production and monitoring wells were revised to ensure that the wells are constructed properly and not acting as conduits for contaminants to migrate vertically. In addition, the site's well-abandonment program is closing all unnecessary wells, removing potential conduits for contamination migration. Monitoring wells are installed around existing facilities where there is a potential for groundwater impact. New facilities are required to install monitoring wells prior to construction and startup.

Objectives

The objectives supporting the Groundwater Protection Program and the Waste Management Program are as follows:

- groundwater consumption - to protect the quantity and quality of groundwater resources by managing consumption for best resource utilization
- hydrogeologic understanding - to understand the natural conditions of hydrology and geology that exist near the site
- groundwater monitoring - to assess groundwater quality to determine any impacts from site operations
- groundwater conservation - to protect water resources by managing the quantity of water being used in comparison to the resources available
- waste disposal requirements - to comply with applicable federal and state regulations, DOE orders, and operating contractor policies related to groundwater protection, waste treatment, and waste disposal activities
- waste disposal strategy - to provide a waste disposal strategy consistent with applicable laws, DOE orders, and operating contractor policies for each waste stream, including a comprehensive waste minimization strategy
- waste unit remediation - to remediate all inactive waste units according to applicable laws and regulations, DOE orders, and operating contractor policies
- groundwater remedial actions - to improve the quality of SRS degraded groundwater to limits agreed to with regulatory agencies
- operational guideline - to operate SRS facilities utilizing site groundwater protection designs and procedures

Strategy

The strategy for reaching the groundwater protection and waste management objectives includes the following:

- identifying regulatory and other protection requirements
- understanding the hydrogeological system and promoting innovative, cost-effective means of meeting the requirements through research and development
- developing physical and administrative controls to protect groundwater, utilizing the knowledge gained from research and development
- implementing physical and administrative controls
- evaluating the controls to ensure protection requirements are met

The strategy is illustrated in Figure 7.1.

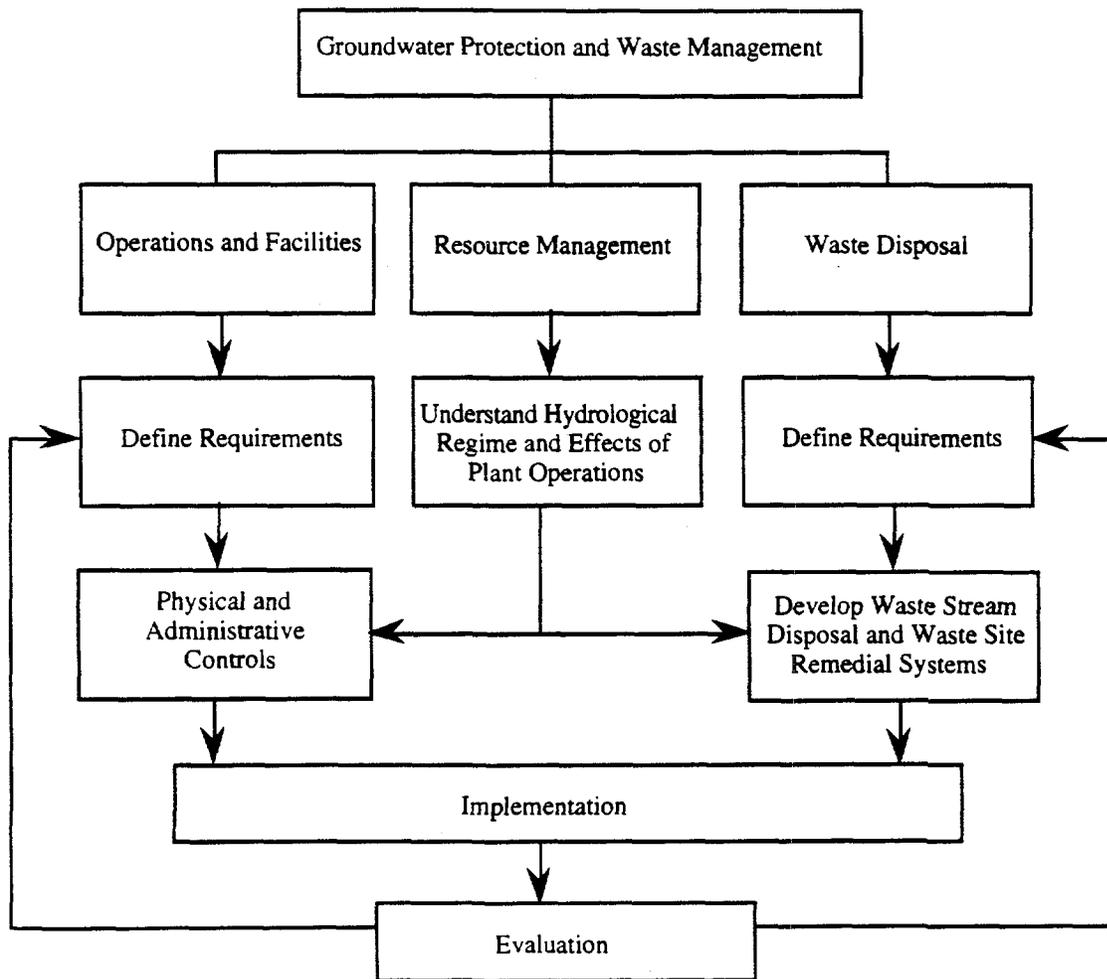


Figure 7.1. Groundwater Protection and Waste Management Strategy

Implementation

The implementation section identifies issues and those responsible for achieving defined objectives. Each environmental effort will require funding for one or more of the following: research and development, operations, programs, and construction/modification projects. The following programs are discussed in the implementation section:

- Groundwater Consumption (page 7-10)
- Hydrogeological Regime Analysis (page 7-13)
- Groundwater Monitoring (page 7-19)
- Water Conservation (page 7-27)
- Contamination Prevention (page 7-29)
- Contamination Detection (page 7-34)

Groundwater Consumption

(Compiled and reviewed by Dan Wells)

Site Program Overview

Managing groundwater consumption and understanding the effects of SRS groundwater consumption on the regional hydrogeological regime are essential to SRS's groundwater protection program. A primary goal of SRS's groundwater protection effort is to ensure that SRS groundwater consumption does not stress irreparably the yield of the underlying regional hydrogeological system.

Environmentally sound management of groundwater consumption practices is being done through various SRS efforts. Considerable evaluation of site hydrogeology through past and ongoing projects is allowing for refined delineation and predictive modeling of the regional hydrogeological regime. The Environmental Protection Department (EPD) is leading the development of a water resource plan for SRS which will ensure the protection, management, conservation, and monitoring of water quality and quantity. Other efforts are directed at enhancing the monitoring of groundwater consumption.

Five-year Outlook

Water consumption on the site should stabilize or decrease over the next five years due to changes in the site's mission. The number of wells being pumped will also decrease as the Site Services Department pursues a domestic water consolidation program.

Regulatory Requirements

The South Carolina Water-Use Reporting and Coordination Act authorizes the South Carolina Water Resources Commission (SCWRC) to require the reporting of information relative to substantial use, withdrawal, or diversion of surface, underground, or other waters in quantities greater than 10,000 gallons per month. Required information includes locating the wells or facilities where water is used, withdrawn, or diverted; identifying the source and location of the water; and identifying the amount of water used, withdrawn, or diverted. The Safe Drinking Water Act (SDWA) imposes requirements on installing and maintaining drinking water wells.

South Carolina Regulation R.61-71, Well Standards and Regulations, is applicable to most newly constructed wells, including water-supply wells, monitoring wells, and piezometers. To satisfy this regulation, a water well record form (HDI-977) for each

well must be submitted to the South Carolina Department of Health and Environmental Control (SCDHEC) within 60 days of completing the well installation or abandonment.

Groundwater consumption management supports the groundwater consumption objective.

Organizational Responsibilities

Discussed below are those groups responsible for groundwater consumption management.

Environmental Protection Department (EPD)

The geological oversight group in EPD is responsible for coordinating all groundwater protection activities. The group coordinates the technical and reporting aspects of groundwater consumption, preservation, remediation, and contaminant monitoring activities. The group monitors the status of all ongoing groundwater projects, and maintains comprehensive documentation of project activities. All groundwater projects require approval from the manager of EPD's geological oversight group, or his designee. The geological oversight group's manager interacts with all custodial departments and environmental coordinators, and works with or is a member of all groundwater-related task forces.

EPD is responsible for the technical and regulatory review of all activities affecting groundwater consumption. EPD also reviews groundwater consumption activities to determine if site policies, objectives, and commitments are being met. The geological oversight group is responsible for coordinating all reporting activities relating to SRS groundwater consumption, e.g., EPD compiling and reporting sitewide water use data. EPD is responsible for supporting custodial efforts with regulatory expertise.

Custodians

Various custodial departments have personnel responsible for documenting water use activities to ensure responsible use of water resources, and to compile data for the quarterly *Water-Use Report* submitted to the South Carolina Water Resource Commission.

Site Procedures and Documents

The details of the site's plan for managing water consumption are contained in WSRC-RP-93-1572, *Water Resource Management Program at The Savannah River Site Aiken, South Carolina*. Standards for the design, construction, and abandonment of the site's production wells are maintained in EPD-PED-902581, *Production Well Standards*. As stated above, water consumption data appears in the quarterly *Water-Use Report*.

Programs

Installing metering devices for all production wells (i.e., greater than 10 gpm) is necessary to comply with the South Carolina Water Use and Coordination Act's reporting requirements and to provide precise, baseline information for SRS's Water Conservation Program. Flow meters are installed for all new production wells.

Monitoring and Compliance

The South Carolina Water Use and Coordination Act requires SRS to report substantial use, withdrawal or diversion of surface, underground, and other waters to the SCWRC. Specifically, this act requires all users of 10,000 gallons or more of water a day to report water use for each quarter. EPD presently completes the sitewide quarterly water use reports from data collected from SRS custodians and submits them to SCWRC. USGS also receives copies of the reports to evaluate regional water resources.

One-year Road Map

WSRC will continue to submit quarterly *Water Use Reports* to the S. C. Water Resource Commission. Work on the domestic water consolidation program will continue.

Five-year Road Map

The domestic water consolidation program will be completed in 1997. At that time, most areas of the site will have their domestic water supplied by three A Area wells. Water demand on the site will remain stable.

Hydrogeological Regime Analysis

(Compiled and reviewed by Dan Wells)

Site Program Overview

Describing the hydrogeological regime at SRS is an integral planning component of the groundwater protection program. Analyzing both the natural systems and the effects of large-volume pumping centers are the two primary tasks of this effort.

Numerous wells have been installed onsite. Many of the deeper wells have been both *cored and geophysically logged*, which provides information on the vertical distribution of bulk, and the physical parameters affecting groundwater flow. Aquifer tests provide field estimates of groundwater flow rates and directions, as well as the degree of confinement of an aquifer beneath a portion of the site. Special core sections have been acquired that are suitable for measuring both porosity and permeability.

Analyzing the field data includes correlating logs into stratigraphic cross-sections, comparing well logs with seismic cross-sections, piezometric and/or potentiometric surface maps, calculating groundwater flow rates and directions, calculating vertical and lateral gradients, assessing leakage coefficients of regional aquitards, and many other efforts.

Numerical modeling of the aquifer system beneath SRS assesses both short- and long-term consequences of water withdrawals. The impact of regional droughts has been considered, but the primary modeling emphasis is on particle tracking to assess pathways of contaminant migration and assess the impact of large-volume pumping centers on groundwater flow rates and directions.

Head-reversal studies assess both the lateral extent of and changes in the area beneath SRS in which there is an upward flow gradient between the uppermost Cretaceous aquifer and the overlying, uppermost aquifer. Additional data have added many control points for contouring the lateral extent of head reversal. The local influence of pumping centers in the general separations areas (GSA) has been the subject of several numerical modeling studies.

Five-year Outlook

The Site Geotechnical Services Department (SGS) will complete a sitewide atlas of geology and hydrogeology. SRTC will continue programs directed at characterizing the site's aquifer units. The USGS will complete the Savannah River "underflow study" which is intended to determine if tritium is migrating into Georgia through groundwater flow under the Savannah River.

Regulatory Requirements

Federal Laws

Resource Conservation and Recovery Act (RCRA)—These regulations include requirements for groundwater monitoring (40 CFR 264 and 265). Many of these requirements imply a thorough description of the hydrogeological regime; particularly, defining the uppermost aquifer and determining groundwater flow rates and directions.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)—CERCLA regulations govern the environmental restoration at facilities designated on the National Priorities List (NPL). SRS was included on the NPL in December 1989. **On August 16, 1993, the EPA declared the Federal Facility Agreement effective. The Federal Facility Agreement (FFA) is a tri-party agreement between SCDHEC, EPA-IV, and DOE-SR that directs the comprehensive remediation of SRS and establishes requirements for the prevention and mitigation of releases or potential releases at SRS.**

State Regulations

R.61-61-Solid Waste Regulation—Post-closure monitoring requirements include using a monitoring well, which implies assessing the water table's location and determining the downgradient direction.

R.61-66-Industrial Solid Waste Disposal Site Regulation—If hazardous waste is present, groundwater monitoring requirements imply an assessment of the water table's location and a determination of the downgradient direction in the "uppermost" aquifer as defined by SCDHEC.

R.61-70-South Carolina Landfill Regulation—The requirement for monitoring wells implies an assessment of the location of the water table and a determination of the downgradient direction in the "uppermost" aquifer as defined by SCDHEC.

R.61-79.264 and 265 Hazardous Waste Management Regulations—Groundwater monitoring regulations require extensive knowledge of the hydrogeological regime.

Consent Orders

CO 85-70-SW—DOE agreed to additional groundwater- assessment activities at and around the M-Area Settling Basin and the F- and H-Area Seepage Basins, under the terms of an Administrative Consent Order signed November 7, 1985 and amended in 1988. The requirements have been defined in the RCRA Permit for the facilities. These activities require a detailed understanding of the hydrogeological regime at each unit.

SA 87-52-SW—A settlement agreement signed November 12, 1987 also requires groundwater quality assessments at several waste units.

DOE Orders

5400.1 - General Environmental Protection Program—This DOE order requires the developing of groundwater protection management and groundwater monitoring programs for the site.

5480.2 - Hazardous and Radioactive Mixed Waste Management—This DOE order requires groundwater monitoring at all solid, hazardous, and mixed waste management facilities to ensure that groundwater quality is not degraded. Assessing groundwater degradation requires knowledge of the hydrogeological regime.

5820.2A - Radioactive Waste Management—This DOE order requires that the waste management plan for each facility describe groundwater monitoring programs for both radioactive and nonradioactive constituents.

Organizational Responsibilities

All activities in geology, seismology and geotechnology at WSRC are integrated under the Site Chief Geotechnical Engineer who reports to the Site Chief Engineer (E&PD) **and manages the Site Geotechnical Services Department.** WSRC operating divisions (SSD, NMPD, SW&ER, and RRD) have the responsibility for accomplishing their assigned missions and will provide E&PD, SRTC and ESH&QA with clear and concise technical support requirements.

A Memorandum of Understanding was signed October 30, 1992 which describes the responsibilities.

ESH&QA will provide environmental, safety, health and quality assurance support to all SRS organizations consistent with site policies. ESH&QA will administer the sitewide drilling contract except for production well drilling. Construction Management's soil borings performed during foundation studies, road building, trenching, and other construction activities often provide useful hydrogeological information, such as the depth to the water table. Piezometers and dewatering wells often are installed during construction of large buildings.

ESH&QA will conduct groundwater and soil sampling and laboratory analyses for regulatory oversight programs and, when requested, for well custodians. EMS hydrologists and geologists administer subcontracts for geophysical logging, monitor well drilling, pump and aquifer testing, and coring projects. Technical staff help characterize site aquifers and assist in interpreting groundwater flow directions. This organization also is responsible for research related to groundwater sampling and analysis. ESH&QA will also provide the regulatory oversight, regulatory interpretation and guidance, and interface with the regulators for environmental-protection activities. In its oversight role, EPD may suggest projects to SRTC or custodians, fund special studies, prepare policy and guidance statements, such as a water resource management plan, request acquisition of particular data, or conduct research of sitewide regulatory significance.

SRTC will conduct sitewide/regional hydrology, geology and seismology programs and technology development. SRTC will perform geology, seismology, geotechnical (GSG) integrated technology demonstrations, perform groundwater model analysis and groundwater model code development, and approve groundwater codes. SRTC will develop the GSG/GIS data architecture, as specified by the Chief Geotechnical Engineer. SRTC will determine SRS seismic hazards, perform seismology analyses and faulting investigations, and maintain the seismic monitoring network. SRTC will perform risk analyses with guidance from ESH&QA and SW&ER to support environmental assessments.

E&PD will define and interpret engineering codes, standards, and practices for all GSG activities, manage a comprehensive GSG/GIS data base, and perform groundwater modeling with SRTC approved codes. E&PD will provide field oversight of geotechnical, drilling, and soil/foundation/remediation construction activities. E&PD will perform GSG studies necessary to support construction/facility activities including geotechnical characterization, soil mechanics studies, static and dynamic foundation analysis, embankment and dam stability analyses, and provide geotechnical pre-conceptual studies.

E&PD and SRTC will review geological, seismological and geotechnical reports before incorporation into regulatory documents or before such information is released to the public. The site geotechnical engineer will represent or concur with WSRC representation on all GSG matters in meetings and presentations with the DOE, the public, oversight boards and regulators.

Site Procedures and Documents

The procedures for drilling, sampling, geophysical logging and well installation are contained in manual 3Q5, *Hydrogeologic Data Collection*. An up-to-date discussion of the site's geology and hydrogeology appears in WSRC-RP-93-1572, *"Water Resource Management Program at The Savannah River Site, Aiken, South Carolina*. More detailed descriptions of conditions around many specific sites can be found in RCRA Part B permit application packages or RFI/RI work plans associated with those sites.

Programs

SRTC-ESS

All hydrogeologic regime analyses performed for research are directed by the ESS staff. These projects include the Baseline Hydrogeological Investigation, Aquifer Characterization Program, head reversal studies, and others. In addition, ESS works closely with Environmental Restoration Department (ERD) scientists to complete more site-specific hydrogeologic regime analyses. Examples include particle-tracking studies and groundwater flow modeling in GSA, A/M Area, TNX, and groundwater flow patterns near coal piles.

Environmental Restoration

ER also performs hydrogeological regime analysis. In these cases, the projects ordinarily involve groundwater monitoring of a waste unit or inactive or closed facility. Examples include the M-Area Settling Basin area and groundwater activities in GSA.

Technical Support**Understanding the SRS Hydrologic Cycle**

Stratigraphic Definition of SRS—This study documents the geology, hydrology, and geohydrology of SRS. This is a geological study of the entire sedimentary column, with a goal to define aquifers underlying SRS, the interconnections, and the hydraulic properties. Aquifers will be delineated in both the regional and unit-specific geological framework.

Detailed Characterization of SRS Aquifer Systems—This program includes pumping tests and detailed chemical analysis of groundwater samples collected from wells installed as part of the Baseline Hydrogeologic Investigation. The groundwater chemistry portion of the program is being completed to provide a better estimate of groundwater flow rates and paths. This information then will be used as input for groundwater flow and transport models.

Seismology of SRS—This program maintains and upgrades four vertical, two horizontal, and three downhole sensing seismometers as part of SRS's seismological network. By the end of this year, six, three-component seismometers will be installed at locations offsite.

Geologic Map of SRS—This program calls for creating a surface geologic map of SRS. ESS scientists will work closely with geologists from the South Carolina Geologic Survey to complete this task. Maps of quadrangles surrounding SRS already have been completed.

Geophysical Studies—This study will develop an understanding of the three-dimensional geologic structure beneath the site. Techniques used will be geomagnetic, seismic, and gravity surveys.

Offsite Geological Investigations:

South Carolina—SRS is coordinating a project with SCWRC to establish a permanent network of clustered wells offsite to study the hydrogeologic regime throughout South Carolina.

Georgia—DOE is funding a five-year study for the USGS to investigate groundwater flow, especially in the Cretaceous aquifers, across the Savannah River into Georgia. A

better understanding of groundwater flow directions and magnitudes in the area surrounding SRS is required. This study will aid the existing knowledge base.

One-year Road Map

SGS will complete the initial draft of the sitewide geologic and hydrogeologic atlas. This document will standardize geologic nomenclature to be used across the site. USGS will conduct several pump tests at selected areas around the site.

Five-year Road Map

All elements of the sitewide geologic atlas will be completed. The USGS study of potential flow from the site to Georgia beneath the river will be completed. SRTC studies of onsite aquifer units will be ongoing.

Groundwater Monitoring

(Compiled and reviewed by Dan Wells)

Site Program Overview

Protecting the aquifers underneath SRS is a major component of the groundwater protection and waste management program. EPD's office of the site groundwater coordinator is leading the organization responsible for aquifer protection through a comprehensive monitoring effort. Many groundwater monitoring wells have been installed onsite. The data are being examined to monitor existing plumes and to identify any additional impacted locations.

Five-year Outlook

The installation of groundwater monitoring wells will continue at a relatively steady rate for the next five years. At the same time, the size of the well sampling program will decrease due to the implementation of a sample optimization program. Historical analytical data from water and soil sampling will be readily available to environmental personnel through the use of a user friendly Geochemical Information Management System.

Regulatory Requirements

Federal Laws

Resource Conservation and Recovery Act (RCRA)—RCRA regulations include explicit specifications for groundwater monitoring requirements (40 CFR 264 and 265).

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)—CERCLA regulations govern restoring the environment at facilities designated on the NPL. SRS was included on the NPL in December 1989.

Public Law 98-181—This law, passed in 1983, specified discontinuing the use of the settling basin in M-Area by November 1985 and required the Department of Energy-Savannah River (DOE-SR) to develop a plan for groundwater protection and submit it to Congress. The authorization to design and construct the M-Area effluent treatment facility (ETF) is included in the law. SRS met the requirements of Public Law 98-181 by closing the M-Area Settling Basin in July 1985 and by submitting a groundwater protection plan to Congress in May 1984. The provisions in the plan represent ongoing commitments.

State Regulations

R.61-61 - Solid Waste Regulation—This regulation specifies procedures for closing or abandoning solid waste disposal units. The requirements include post-closure monitoring by at least one monitoring well with readings collected quarterly for submittal to the State Board of Health's Solid Waste Division.

R.61-66 - Industrial Solid Waste Disposal Site Regulation—This regulation requires a permit for operating any industrial, solid waste system. If the system involves hazardous waste, then a groundwater monitoring system must be developed into the unit plan.

R.61-70 - South Carolina Landfill Regulation—The South Carolina Landfill regulation requires an owner or operator of a solid waste disposal facility to obtain a permit to operate a sanitary waste landfill. In addition, observation test wells that provide reliable data on groundwater contamination must be included in the unit design.

R.61-71 - Well Standards and Regulations—The South Carolina Well Standards and Regulations apply to any newly constructed well, including water supply and monitoring wells. These regulations establish minimum standards for well construction and well locations. They require that a water-well record form (HDI 9-77) be submitted to SCDHEC within 60 days after completing any well or the abandonment of a well.

R.61-79.264 - Hazardous Waste Management Facilities Regulation—The hazardous waste management regulation establishes minimum standards for managing hazardous waste for owners or operators of permitted hazardous-waste treatment, storage, and disposal facilities. The groundwater protection standards, required by this regulation, will be met once SRS obtains its complete permit.

Consent Orders

CO 85-70-SW—DOE agreed to additional groundwater- assessment activities at and around the M-Area Settling Basin and the F- and H-Area Seepage Basins, under the terms of an Administrative Consent Order signed November 7, 1985 and amended in 1988. The requirements have been defined in the RCRA Permit for the facilities. These activities require a detailed understanding of the hydrogeological regime at each unit.

SA 87-52-SW—A settlement agreement signed November 12, 1987 also requires groundwater-quality assessments at several waste units.

DOE Orders

5400.1 General Environmental-Protection Program—This DOE order requires developing groundwater monitoring programs at the site.

5480.2 Hazardous and Radioactive Mixed Waste Management—DOE Order 5480.2 establishes hazardous-waste management procedures for DOE facilities that generate,

transport, treat, store, and/or dispose of hazardous waste. This order requires groundwater monitoring of all solid, hazardous, and mixed-waste management facilities to ensure that groundwater quality is not degraded.

5820.2A Radioactive Waste Management—DOE Order 5820.2A establishes policies and guidelines for DOE to manage its radioactive waste, waste byproducts, and radioactive contaminated surplus facilities. Under this order, the waste management plan for each radioactive waste management facility must include a section on the radioactive and nonradioactive monitoring programs, including groundwater monitoring.

The groundwater monitoring program supports the hydrogeological regime objective.

Organizational Responsibilities

Groups responsible for groundwater monitoring activities are discussed below.

Custodians of facilities that have affected or are likely to affect groundwater are responsible for assessing the groundwater impact. This includes a significant effort to describe the site hydrogeology. These projects are performed by SRTC, EPD, EMS, custodial staff, and consultants. The primary custodian role lies with ERD.

Operating organizations proposing hydrogeological-related efforts must complete and submit a general program plan for hydrogeologic work at SRS to EPD. Prior to commencing the project EPD and SRTC must approve the plan. EPD is responsible for coordinating all activities relating to the quantity and quality of groundwater, including program completeness, consistency, uniformity, and progress, and for reviewing data and reports prior to transmittal to the regulatory agencies.

Groundwater projects are carried out by the department with custodial responsibility for the geographical area where the project will occur. Most well drilling, soil boring and monitoring activities are centralized in EPD. The custodians are responsible for budgeting and planning groundwater projects, managing the projects, conducting data evaluations and preparing reports. EPD and SRTC support organizations have the expertise to conduct data evaluations and prepare reports. EPD administers most of the well-drilling contracts.

EPD is responsible for administering subcontracts for groundwater well drilling, sampling, and analysis. EPD ensures that quality-assurance and quality-control requirements for sampling and analytical programs are met. Analytical results are sent directly to the appropriate custodian or through EPD. EPD maintains a computerized database containing well-construction records, well logs, cores, and analytical data.

EPD has established an extensive and comprehensive Groundwater Monitoring Program (GWMP). The purpose of the GWMP is to determine if any SRS facilities have influenced groundwater quality, and if they have, to quantify the influence. Facilities monitored include waste disposal sites, spill sites, chemical storage areas, process sewers, and certain process buildings.

ERD has submitted a *Contaminated Groundwater Management Plan* to DOE.

Site Services Engineering is responsible for coordinating process and domestic water well construction, maintenance, and abandonment activities.

Site Procedures and Documents

Procedures for drilling, well installation, sampling and analysis appear in Procedure Manual 3Q5, *Hydrogeologic Data Collection*. A description of the monitoring program is presented in WSRC-3Q1-2, Vol. 2, *Groundwater Monitoring Plan*. Information on the location and construction of most wells is contained in the *Environmental Protection Department's Well Inventory*. The Environmental Monitoring Section issues quarterly reports containing all analytical results for the quarter.

Programs

Oversight

Custodial departments proposing hydrogeological-related efforts must complete and submit a general program plan for hydrogeologic work at SRS to EPD. Prior to commencing the project, EPD must approve the plan. EPD is responsible for coordinating all activities relating to the quantity and quality of groundwater, including program completeness, consistency, uniformity, and progress, and for reviewing data and reports prior to transmittal to regulatory agencies.

Procedure Manual 3Q5, Hydrogeologic Data Collection Methods, was developed to establish a single set of procedural methods for acceptable hydrogeological investigation data collection and selected environmental testing protocols. The manual is organized so that updates require minimal effort. New sections may be added as activities requiring standardized procedures are identified.

Groundwater Monitoring Program

SRS has established an extensive and comprehensive Groundwater Monitoring Program (GWMP). The purpose of GWMP is to determine if any SRS facilities have influenced groundwater quality, and if they have, to quantify the influence. Facilities monitored include waste disposal units, spill sites, chemical-storage areas, process sewers, and certain process buildings. EMS conducts all compliance groundwater monitoring at SRS. GWMP is composed of the following four subprograms:

- well drilling, maintenance, and abandonment
- water sampling
- sample analyses
- data management and reporting

The following are projects that support the GWMP described below:

- *Well Drilling, Maintenance, and Abandonment*—Monitoring wells are drilled and installed according to procedures and specifications described in 3Q5-Hydrogeologic Data Collection. A detailed protocol is mandated to ensure construction continuity. Such specifications conform to recently published SCDHEC guidelines. A monitoring-well installation report is completed and submitted with the general program plan for EPD review and approval. A final report is submitted to EPD upon completion of the well installation process. The maintenance of all monitoring wells is done on a quarterly inspection by the sample-collection contractor. EPD has identified and located all monitoring wells within SRS that serve no present or future use and can be abandoned. The well abandonment program is ongoing with PES and EPD in the lead. The 3Q5 manual provides the procedures and specifications for abandoning groundwater monitoring wells. *The Production Well Standards Manual* (WSRC-EPD-PED-902581) provides specifications for abandoning production wells. The intent of these procedures and specifications is to return each aquifer and overlying sediments to as near the original state as possible. An abandonment program plan is prepared for each well or group of wells to be abandoned. All proposed abandonment program plans are reviewed and approved by EPD.
- *Monitoring Well Surveying*—This task involves subcontracts awarded to surveying firms so that new wells and soil cores accurately are placed and existing wells and soil cores may be located accurately, even after a long period of abandonment. Typically, surveying teams gather the well number, SRS grid coordinates, casing elevation, and ground elevation information.
- *Monitoring Well Drilling and Soil Coring*—This task includes all monitoring-well and soil core drilling, installing, and abandoning activities conducted by EMS. The actual well drilling and soil coring is subcontracted. Waste unit custodians are responsible for transferring funds to EMS to pay for well installations, soil core drilling and abandonment activities.
- *Technical Oversight of GWMP*—Qualified support is provided to oversee contractors working in EMS GWMP. An independent contractor provides an individual to oversee another contractor's activities. Additional support is provided as needed. This task supplements EMS by providing additional oversight of subcontractors. Activities that receive oversight from this project are well drilling and installation, soil coring, and well maintenance.
- *Monitoring Well Maintenance*—Well maintenance is the repair or replacement of malfunctioning electrical and mechanical equipment, in addition to routine maintenance. The objective of this task is to maintain the monitoring wells to minimize well contamination and failure and to comply with all state and federal regulatory requirements. Well maintenance activities are conducted by a subcontractor.

Water Sampling

- Properly collecting groundwater samples is of prime importance in conducting a complete and defensible hydrogeologic investigation. The protocol used to ensure representative groundwater samples is: obtaining a sample that is representative of subsurface conditions; minimizing the potential for contaminating samples from sampling equipment, jars, etc.; proper logging, field testing, filtering, and preserving the samples; and proper documenting, including chain-of-custody records. A sampling program description form (3Q5-XI-1) must be completed and submitted along with the general program plan to EPD for review and approval prior to initiating a groundwater sampling program. The sampling program must be developed using the specific field procedures described in *Procedure Manual 3Q5*. Those procedures assure compliance with the accepted EPA sampling protocol.

In an effort to contain costs, EPD is re-evaluating the sampling programs at many sites. This effort, known as the Sample Optimization Program, is aimed at making responsible reductions in the cost of the monitoring program without sacrificing quality or compliance. Where possible, sampling frequencies are being reduced. In fact, many wells are being dropped from the sampling schedule altogether. Also, the program is reviewing the requirements for the analyses performed on the samples, in order to reduce unnecessary analyses.

Sample Analyses

The analytical laboratories contracted to perform sample analyses adhere to the analytical methods and detection limits prescribed by EPA's sampling protocol SW-846 (3rd ed). The chemical constituents analyzed include: volatile organics; acid extractable and base neutral organics; pesticides and polychlorinated biphenyls (PCBs); inorganics; and radiological constituents. The accuracy and precision of the data generated by the contractor are determined through analyzing replicates, spiked samples, synthetic reference samples, and field or laboratory blanks submitted with each set of samples.

Data Management

GWMP provides a data-management unit which receives, collates, and reviews data from various sources (laboratory, field personnel, drilling documentation, etc.) and organizes this data into a report-ready database. Data can be extracted from the database by personal computers connected to SRS's local area network. Monthly printouts highlighting flagged analyses are forwarded to the custodians and EPD. The flagged values do not necessarily have regulatory significance; they are intended to assist with data interpretation and scheduling. This printout provides the custodians and EPD preliminary data, allowing them to assist in the review process at the earliest possible point. Analyses are compiled in quarterly reports which are issued to the custodians and EPD. The custodians have the responsibility for data interpretation. The data management element of GWMP is described in detail in DP-MS-87-109, *The*

Organization and Operation of the Savannah River Site's Groundwater monitoring Program.

Well construction data for approximately 2200 unit wells are located in a centralized database. The data provides information on well construction details such as location, coring, drilling, geophysical logging, maintenance and abandonment. It provides the user with menu-driven searches by the following:

- well ID
- well coordinate
- distance (radius) from SRS coordinates

The well construction data system is part of an effort to centralize data associated with the site's groundwater activities.

A second, much larger database contains the validated historical analytical data from the groundwater monitoring program. This database is extremely difficult to query, but a new, user friendly Geochemical Information Management System (GIMS) will be in place this year. This system will allow much easier access to the data.

One-year Road Map

The Sample Optimization Program will reduce the number of groundwater samples taken and the number of analyses performed on those samples. At the same time, new monitoring wells will be installed. A usable Geochemical Information Management System (GIMS) will be put in place. This will simplify the task of interpreting historical sampling data.

Five-year Road Map

The installation of new monitoring wells will continue. Sampling schedules will continue to reflect cost consciousness. The GIMS system will be modified to accommodate analytical data for soils and air.

Water Conservation

(Compiled and reviewed by *Dan Wells*)

Site Program Overview

Protecting the water resources (groundwater and surface water) by managing the quantity of water being used versus the amount available represents an important part of the SRS Groundwater Protection Program and the Waste Management Program. Responsible use of SRS water resources also provides secondary benefits resulting in lower energy and wastewater treatment costs, while ensuring adequate water supplies for future SRS and neighboring activities.

Regional groundwater assessment programs have documented the availability of adequate water supplies (DOE, 1987a). For more than 40 years, SRS operations in conjunction with other local industrial, agricultural, and municipal users have not affected adversely groundwater availability. The abundance of groundwater results in little direct economic benefits from water conservation, but because of the potential for waste minimization, a water conservation program is being developed. Water conservation has resulted indirectly from other environmental regulatory or economically driven programs.

Five-year Outlook

EPD will encourage facility custodians to develop water conservation measures whenever practical. Water consumption on the site will likely drop as a result of the change in mission.

Regulatory Requirements/Justification

State Laws

South Carolina Water Use and Coordination Act—This regulation requires SRS to report water use of more than 10,000 gallons, withdrawal or diversion of surface, underground and other waters in South Carolina to SCWRC.

In addition, South Carolina has drought-response regulations that can require consumption reductions at times.

The water conservation program supports the groundwater conservation regime objective.

Organizational Responsibilities

Discussed below are those groups with the responsibility for the water conservation program.

Environmental Protection Department

EPD is responsible for the technical and regulatory review of all activities affecting groundwater and site geology. EPD provides the lead support for initiating water conservation programs, conducts periodic surveys of water use activities, and provides recommendations for specific conservation programs. Additionally, EPD will address water conservation in conjunction with related environmental audits and assessments in which it participates.

Custodial Departments

Various custodial departments have personnel responsible for documenting water use activities to ensure the responsible use of water resources, and to compile data for the quarterly *Water use Report* submitted to the South Carolina Water Resource Commission. The personnel also are responsible for submitting appropriate water conservation information, as required, to EPD for review and approval.

Site Procedures and Documents

Quarterly water consumption is reported in water the site's *Water-Use Report*. Custodial departments report water use and water conservation steps in their *Annual Water Conservation Assessment Report* , which is submitted to EPD.

Programs

Custodial Departments

The custodial departments will submit an Annual Water Conservation Assessment Report to EPD beginning in FY 93.

The Annual Water Conservation Assessment Report will address the following subjects:

- present fiscal year water use
- previous two fiscal years water use
- reason for increase or decrease
- proposed water conservation projects for next three fiscal years including:
 - project description
 - water savings as a percentage of total use
 - affect on groundwater head reversal if any
 - project cost

SRS has implemented a broad-based waste management program which includes significant waste minimization activities for the Waste Minimization Program. Although specifically designed to minimize waste stream quantity, many of these programs significantly reduce the quantity of process water use. A recent example of this secondary benefit type of water conservation program is the M-Area wastewater

- reduction in the metal-fabrication operations program. Through careful analysis of existing processes, wastewater from 87 process effluents was reduced from 528 gallons per minute (gpm) to 20 gpm (Martin et al., 1987). As similar analyses are performed, the water conservation benefits should be reevaluated to justify the need for such programs.
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Environmental Protection Department

EPD provides the technical and regulatory review of all activities affecting groundwater and the lead support for initiating water conservation programs. Periodic surveys of water use activities, recommendations for specific conservation programs, and water conservation in conjunction with related environmental audits and assessments are ongoing activities.

Site Services Engineering

Installing metering devices for all production wells (i.e., greater than 10 gpm) is necessary to accurately report sitewide groundwater use to the South Carolina Water Resources Commission on a quarterly basis and to provide precise baseline information for SRS's water conservation program. Existing production wells will be retrofitted with flow meters by June 1996.

One-year Road Map

The custodial departments will submit *Annual Water Conservation Assessment Reports* to EPD.

Five-year Road Map

The custodial departments will continue to submit annual reports to EPD. Water consumption at the site will stabilize or decrease.

Contamination Prevention

(Compiled and reviewed by Ross L. Fanning)

Site Program Overview

Systems to prevent groundwater contamination include all site diking systems and procedures, well design and installation specifications, and new underground storage tanks, associated equipment and piping systems. Diking systems prevent groundwater contamination by containing small leaks from above-ground facilities in addition to protecting surface waters from spill runoff. Well specifications and procedures in *Procedure Manual 3Q5* prevent contamination by ensuring all wells are installed properly to prevent cross contamination of aquifers, in addition to meeting regulatory construction requirements. All new tank systems containing hazardous substances as defined in the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), petroleum products, or hazardous waste, provide groundwater protection with double-walled, steel construction with interstitial monitoring and cathodic protection.

Since the site diking program and well specifications are discussed in other sections of the plan, this section deals almost exclusively with SRS's underground storage tank program.

Five-Year Outlook

Underground storage tank compliance over the next five years will require ongoing release detection for existing tanks and initiating projects to replace or upgrade tanks that don't meet new tank-performance criteria. All underground storage tank systems must meet the performance requirements of new systems by December 22, 1998. Existing tank systems may be replaced, upgraded, or closed.

Regulatory Requirements

The Hazardous and Solid Waste Amendments of 1984 (HSWA) expanded the RCRA in Subtitle I to include underground storage tanks. The final underground storage tank regulations (Subtitle I) were promulgated in 1988. DOE entered into negotiations with SCDHEC to include underground storage tanks in the existing Memorandum of Agreement (MOA). This gave SCDHEC control over tanks containing petroleum products at SRS under the existing SCDHEC underground storage tank regulations.

Federal Law

Resource Conservation and Recovery Act (RCRA)—Permitting tanks regulated under RCRA Subtitle C is a two-part process. The first part involves submitting a Part A application, containing basic information describing the tank system. The second part involves submitting a Part B application, containing more detailed information of the tank system and a certified tank assessment. The hazardous-waste tank regulations

require that all new tank systems have secondary containment with release detection, be built with material compatible with the waste type, and be protected from corrosion.

Regulations resulting from Subtitle I require EPA notification of all underground storage tanks in operation which contain petroleum products or a hazardous substance, as defined in CERCLA. SCDHEC was notified of all applicable tanks at SRS on May 8, 1986. All new tanks must have a release-detection system, corrosion protection, spill-and overfill-prevention devices, and be constructed with material compatible with the substances to be stored.

State Regulations

Underground Storage Tank Control Regulations (R.61-92)—These regulations require that all tanks installed after January 1, 1986, prevent releases due to corrosion, have a release-detection system, and maintain an inventory recordkeeping system. The regulations also include requirements for notifications, permitting, installations, general operations, corrective actions, and abandonment activities.

Policy

SRS's policy is to handle hazardous materials in pipelines and vessels above ground as long as it is safe and technically and economically feasible. When underground installations are appropriate, measures must be taken to ensure that such installations environmentally are sound. A comparative risk analysis must be performed to determine if the system may be installed underground. All new underground storage tanks which contain a hazardous substance or a petroleum product will be double-walled steel with interstitial monitoring and cathodic protection.

Contamination-prevention systems support waste disposal requirements and the operational guidelines objectives.

Organizational Responsibilities

Environmental Protection Department (EPD)

EPD is responsible for communicating applicable hazardous-waste and underground storage tank regulation requirements to the custodial departments. EPD also is the interface with DOE and SCDHEC, including permit transmittals. EPD also is responsible for sitewide consistency in information included in the hazardous-waste tank assessments.

EPD is responsible for overseeing the SMARTS program as it applies to underground-tank systems. This includes reviewing the comparative risk analysis, obtaining plant manager approval for tank installation, coordinating the permitting of new facilities, ensuring all departments have an active inventory program, and updating the SMARTS program when new regulations are promulgated. The

SMARTS program also requires that all tanks subject to Subtitle I regulations have an inventory recordkeeping system. The program also provides plant policy on operating requirements, corrective-action responsibilities and abandonment practices.

Custodians

Custodians also are responsible for identifying the new tank systems required to meet the facility needs and for acquiring the funding for tank design, construction, and installation. Custodians also are responsible for providing the information required for the applicable permits. A listing of SRS's underground storage tanks by custodian is provided in Table 7.2.

Site Procedures and Documents

WSRC 3Q, *Procedure ECM 6.6, Underground Storage Tank Management and Removal*, outlines the requirements for proper management or closure of underground storage tanks. WSRC-IM-90-90, *Specifications and Management for Regulated Tank Systems*, provides custodians comprehensive guidance concerning the proper operation, maintenance, installation, closure, and corrective action for regulated tank systems.

Technical Support Programs

The custodial departments' monitoring and surveillance systems are detailed in the next section, contamination detection.

Diking Systems

SRS's program is to retrofit existing above-ground storage areas with impervious diking systems to contain leaks and spills. All new site facilities are required to include containment structures as part of the original design. Although the primary justification for these systems is to protect surface water spills and leak runoffs, totally-contained dikes also provide groundwater protection by containing small leaks.

Well Specifications

SRS has standard well specifications for the design, construction, and operation of monitoring and production wells. These specifications ensure all new monitoring wells are installed according to RCRA requirements. Site procedures ensure these wells are sampled and analyzed according to EPA protocol standards. The monitoring-well specifications and sampling procedures are contained in *Procedure Manual 3Q5*. Although these specifications and sampling procedures primarily were designed to comply with rigid, regulatory sampling requirements and health standards, these strict standards protect the groundwater by lowering the potential for an improperly installed well to cross contaminate aquifers.

One-Year Road Map

Construction Management plans to replace four underground storage tanks by installing three above-ground fuel storage tanks at Central Shops. The total tank capacity is expected to be 60,000 gallons (40,000 diesel fuel, 20,000 gasoline).

Transportation is sponsoring a project to replace the 760-7G fuel tank at the Forestry Station. Power Operations will continue its ongoing project to replace or upgrade all existing underground storage tanks.

Five-Year Road Map

Projects should be initiated to replace or upgrade existing underground storage tanks that do not meet new tank-performance requirements. WM/ER also plans to abandon and decommission 31 underground holding tanks which contain radioactive waste.

Table 7.2. Underground Storage Tanks

<u>Organization</u>	<u>Tank Description</u>
Transportation	Service Station Tanks (12)
	Bulk Storage Tanks (2)
Construction Management	Bulk Storage Tanks (2)
	Service Station Tanks (2)
DWPF	Emergency Generator Feed Tanks (2)
Power Operations	Emergency Generator Feed Tanks (4)
	Generator Feed Tanks (2)
Separations	Emergency Generator Feed Tanks (1)
	Generator Feed Tanks (2)
Savannah River Ecology Lab	Emergency Generator Feed Tanks (2)
Reactor	Generator Feed Tanks (4)
Wackenhut Security	Fueling Tank (1)
Waste Management	Standby Generator Feed Tanks (2)
Underground Hazardous Waste Tanks	
Waste Management	Radioactive Waste Storage Tanks (52)

Contamination Detection

(Compiled and reviewed by Ross L. Fanning)

Site Program Overview

Contamination detection includes the site monitoring-well program and the underground storage tanks inventory systems. Monitoring wells are installed around existing facilities if there is an indication of impacted groundwater or if there is a high potential for future impacts. All major new facilities have monitoring wells installed during construction. All underground storage tanks containing hazardous materials, petroleum products, or hazardous waste have an inventory and leakage-detection system. These inventory systems are designed to meet regulatory requirements, as well as to protect the groundwater.

Since the monitoring-well program is discussed in another section of the plan, this section deals almost exclusively with SRS's underground storage tank inventory program.

Five-Year Outlook

Underground storage tank compliance over the next five years will require ongoing release detection for existing tanks and initiating projects to replace or upgrade tanks that don't meet new tank-performance criteria. All underground storage tank systems must meet the performance requirements of new systems by December 22, 1998. Existing tank systems may be replaced, upgraded, or closed.

Regulatory Requirements

The Hazardous and Solid Waste Amendments of 1984 (HSWA) expanded RCRA in Subtitle I to include underground storage tanks. The final underground storage tank regulations (Subtitle I) were promulgated in 1988. DOE entered into negotiations with SCDHEC to include underground storage tanks in the existing Memorandum of Agreement (MOA). This gave SCDHEC control over tanks containing petroleum products at SRS under existing SCDHEC underground storage tank regulations.

Federal Law

Resource Conservation and Recovery Act—Permitting tanks regulated under RCRA Subtitle C is a two-part process. The first part involves submitting a Part A application, containing basic information describing the tank system. The second part involves submitting a Part B application, containing more detailed information of the tank system and a certified tank assessment. The hazardous-waste tank regulations require that all new tank systems have secondary containment with release detection, be built of a material compatible with the waste type, and be protected from corrosion. These regulations also require performing a tank assessment for all existing tanks which do not have a secondary containment system meeting the regulatory

requirements. If a tank does not have a secondary containment system, it must be retrofitted with a secondary containment system which does or be closed.

- Regulations resulting from Subtitle I require EPA notification of all underground storage tanks in operation which contain petroleum products or a hazardous substance, as defined in CERCLA. SCDHEC was notified of all applicable tanks at SRS on May 8, 1986.

All existing tanks must be retrofitted with leak-detection corrosion-protection and spill- and overfill- prevention devices within a 10-year period.

State Regulations

Underground Storage Tank Control Regulations (R.61-92)—These regulations require that all tanks installed after January 1, 1986, to prevent releases due to corrosion, have a release detection system and maintain an inventory recordkeeping system. Under these regulations, each tank must have an inventory recordkeeping system. The regulations also include requirements for notifications, permitting, installations, general operations, corrective actions, and abandonment activities.

Organizational Responsibilities

Environmental Protection Department (EPD)

EPD is responsible for communicating applicable hazardous-waste and underground storage tank regulation requirements to the custodial departments. EPD also is the interface with the DOE and SCDHEC, including permit transmittals. EPD also is responsible for sitewide consistency in information included in the hazardous-waste tank assessments.

EPD is responsible for overseeing the SMARTS program as it applies to underground tank systems. This includes reviewing the comparative risk analysis, obtaining plant manager approval for tank installation, coordinating the permitting of new facilities, ensuring all departments have an active inventory program, and updating the SMARTS program when new regulations are promulgated. The SMARTS program also requires that all tanks subject to Subtitle I regulations have an inventory recordkeeping system. The program also provides plant policy on operating requirements, corrective-action responsibilities and abandonment practices.

Custodians

The custodians are responsible for properly operating the underground tanks. The custodians also are responsible for developing and implementing the regulatory, required inventory systems. It is the custodial departments' responsibility to determine which tanks need to be replaced or upgraded and to acquire the funding necessary to meet applicable regulation requirements.

Site Procedures and Documents

WSRC 3Q, *Procedure ECM 6.6, Underground Storage Tank Management and Removal*, outlines the requirements for proper management or closure of underground storage tanks. WSRC-IM-90-90, *Specifications and Management for Regulated Tank Systems*, provides custodians comprehensive guidance concerning the proper operation, maintenance, installation, closure, and corrective action for regulated tank systems.

Technical Support Programs

A listing of SRS underground storage tanks by custodial department is provided in Table 7.2.

Soil Gas and Geophysical Surveys

SRTC - Environmental Sciences Section—Soil-gas analysis is a tool used at SRS to identify contaminant areas and to track shallow groundwater plumes. The technique has been successful in detecting chlorocarbon, oil, and mercury in groundwater at disposal and spill sites. Soil gas surveys are used as a screening technique in the preliminary characterization of a waste site. Shallow geophysical techniques such as ground-penetrating radar also are being used to characterize waste sites.

Monitoring Well Requirements

EPD—SRS has criteria for installing monitoring wells for early indications of groundwater impacts. Monitoring wells are installed around existing facilities if there are indications of impacted groundwater or if there is a high potential for future impacts. All major new facilities, such as the Defense Waste Processing Facility (DWPF), have monitoring wells installed during construction to obtain pre-startup data and to detect any impacts from operations.

Monitoring/Surveillance/Testing

All custodial departments are required to inventory and maintain inventory records on all underground storage tanks containing hazardous materials, petroleum products, or hazardous waste.

Transportation

Transportation uses both a constant-level monitoring device and computerized automated fuel-pump dispensers at the service station tanks as part of the required inventory program. The level-monitoring device provides information on the number of inches of fuel in the tank, the number of gallons of fuel remaining in the tank, the number of inches of water in the tank, and the fuel's temperature. The automated fuel device provides information on the fuel transactions from a given tank. Manual tank

inventory methods are performed once a week to verify the data obtained from the automated inventory devices.

DWPF

Two underground fuel-storage tanks were installed at DWPF in 1985. The tanks are a double-walled, steel design with continuous interstitial monitoring and sacrificial anodes for corrosion protection.

Construction Management

Construction Management uses manual monitoring devices to obtain in-tank liquid and water levels and metering devices to determine fuel transactions from a given tank. The net gains/losses are computed daily.

Power Operations

Power Operations uses manual and automatic monitoring devices to obtain in-tank liquid and water levels and metering devices to determine fuel transactions from a given tank. The net gains/losses are computed daily.

Waste Management

Waste Management's underground high-level radioactive waste storage tanks each have an electrical reel tape to monitor liquid levels. Each reel tape is verified once a month by comparing readings between a steel tape manually lowered into the tank and the reel tape. Each tank also has a high-level conductivity probe.

Detailed procedures are in place to make material balances when waste is transferred between tanks. Tank-level readings are recorded each hour and a balance is made every four hours during the transfer. Each jacket is sloped to a low point where leak-detection equipment (conductivity probe) is located. Of the 51 tanks, 43 have an annulus. Each annulus has three conductivity probes and one pneumatic liquid-level bubbler. The other eight tanks are single-walled tanks.

Waste Management uses manual monitoring devices to obtain in-tank liquid and water levels in the nonradioactive underground tanks. The net gains/losses are computed daily.

One-Year Road Map

Construction Management plans to replace four underground storage tanks by installing three above-ground fuel storage tanks at Central Shops. The total tank capacity is expected to be 60,000 gallons (40,000 diesel fuel, 20,000 gasoline).

Transportation is sponsoring a project to replace the 760-7G fuel tank at the Forestry Station. Power Operations will continue its ongoing project to replace or upgrade all existing underground storage tanks.

Five-Year Road Map

Projects should be initiated to replace or upgrade existing underground storage tanks that do not meet new tank-performance requirements. SW&ER also plans to abandon and decommission 31 underground holding tanks which contain radioactive wastes.