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Edited by:

M. G. O'Rear[1], J. L. Steele[2], and B. G. Kitchen[2]

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Prepared by:
H. Allen Davis[2], Donna K. Martin[2], and James L. Todd[2]
Co-edited by : Carol L. Cummins[2], Craig S. Hetrick[2], and Dennis A. Stevenson[2]

[1] U. S. Department of Energy
Savannah River Operations Office
P. O. Box A
Aiken, SC 29802, U.S.A.

[2] Westinghouse Savannah River Company
Savannah River Site
Aiken, SC 29808, U.S.A.

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M. G. O'Rear[1], J. L. Steele[2], and B. G. Kitchen[2]

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The environmental surveillance activities at and in the vicinity of the Savannah River Site (SRS) [formerly the Savannah River Plant (SRP)] comprise one of the most comprehensive and extensive environmental monitoring programs in the United States. This overview contains monitoring data from routine and nonroutine radiological and nonradiological environmental surveillance activities, summaries of environmental protection programs in progress, a summary of National Environmental Policy Act (NEPA) activities, and a listing of environmental permits (Appendix A) issued by regulatory agencies. This overview provides information about the impact of SRS operations on the public and the environment.

The SRS occupies a large area of approximately 300 square miles along the Savannah River, principally in Aiken and Barnwell counties of South Carolina. SRS's primary function is the production of tritium, plutonium, and other special nuclear materials for national defense, for other governmental uses, and for some civilian purposes. From August 1950 to March 31, 1989, SRS was operated for the Department of Energy (DOE) by E. I. du Pont de Nemours & Co. On April 1, 1989 the Westinghouse Savannah River Company assumed responsibility as the prime contractor for the Savannah River Site.

ASSESSMENT OF RADIOLOGICAL IMPACT OF SRS OPERATIONS ON THE PUBLIC

Radiation Dose Terms

As used in this overview, the term *dose* normally means "effective dose equivalent." It is defined by the International Commission on Radiological Protection as "the sum of the external dose equivalent plus the committed dose equivalents to specific organs of the body, times a weighting factor appropriate for each organ." The term *dose commitment*, as it is applied to an individual, means "committed effective dose equivalent," which is a measure of the amount of radiation dose received by the individual over a lifetime as a result of exposure to all radiation pathways during the year being considered. In this overview, the individual's lifetime is assumed to extend 50 years beyond the time of exposure.

The terms *dose* and *dose commitment* are sometimes used interchangeably in this overview. The dose commitment to an individual is usually expressed in units of millirem (abbreviated "mrem") or millisievert (abbreviated "mSv") (1 mrem = 1/1000 rem; 1 mSv = 1/1000 Sv; 1 mSv = 100 mrem).

Collective (population) dose commitment is the sum of individual dose commitments in a population group and is expressed in units of person-rem (person-sievert). For example, if each person in a population of 1,000 receives a dose commitment of 1 rem (0.01 Sv), the collective dose commitment would be 1,000 person-rem (10 person-Sv).

Applicable Dose Standards

The DOE radiation standards for the protection of the public in the vicinity of SRS are given in Draft DOE Order 5400.5. These standards are based on recommendations of the International Commission on Radiological Protection (ICRP) and the National Council on Radiation Protection and Measurements (NCRP).

In 1990, DOE Order 5400.5 was issued that contained revised interim standards incorporating the recommendations and dose models contained in ICRP Publications 26 and 30. The previous standards had been based on ICRP Publications 2 and 10. The previous guides were based on a maximum annual dose of 500 mrem (5 mSv) to an offsite individual. The draft DOE order changed the maximum allowable offsite dose to 100 mrem (1 mSv). The revised interim standards, also include Environmental Protection Agency (EPA) limits for the atmospheric pathways contained in 40 CFR 61, Subpart H.

EPA drinking water standards which apply at downriver water treatment plants are based on an annual whole body dose of 4 mrem (0.04 mSv) from the annual consumption of two liters of water per day. Periodically in this overview, radioactivity concentrations are compared with EPA drinking water standard concentrations. While this is a convenient reference, it should be noted that the current EPA standard concentrations for tritium (20,000 pCi/L) and ^{90}Sr (8 pCi/L) correspond to a whole body dose less than 4 mrem. EPA is considering a change to these concentrations to reflect the 4 mrem dose.

Calculation Models

With few exceptions, most of the radioactive materials released from SRS are of such low concentrations that when dispersed in the environment they are not detectable by conventional monitoring procedures. Therefore, radiation doses to offsite populations are calculated with mathematical models that use known transport mechanisms for atmospheric and liquid releases and known major pathways of exposure to man. Environmental measurements of tritium oxide released in small quantities from production areas during routine operations are used to verify atmospheric dispersion in the transport models.

Dose Commitment from Atmospheric Releases

The maximum radiation dose commitment to a hypothetical individual on the SRS boundary from 1988 SRS atmospheric releases of radioactive materials was 0.46 mrem (0.0046 mSv). The 0.46 mrem (0.0046 mSv) is 0.5% of the DOE guide of 100 mrem/yr (1 mSv) for a prolonged exposure to an individual in the public zone. The assumptions used in calculating the maximum public zone dose commitment are conservative; that is, they tend to overestimate the dose commitment. Therefore, it is very likely that the actual maximum individual dose commitment was less than 0.46 mrem (0.0046 mSv). This maximum individual dose commitment from SRS operations was approximately 0.2% of the average dose of 295 mrem (2.95 mSv) per year received in the vicinity of SRS from natural radiation. The radiation dose commitment to the average individual at the plant perimeter was 0.2 mrem (0.002 mSv), which is 0.07% of the average dose of 295 mrem (2.95 mSv) from natural radiation sources.

The population dose commitment from SRS atmospheric releases to the 555,100 people who live within 50 miles (80 km) of the center of the site was 21 person-rem (0.21 person-Sv) with an average dose of 0.04 mrem (0.0004 mSv) per person. During 1988, this same population received an estimated annual radiation dose of 164,000 person-rem from natural radiation and an additional dose of 29,400 person-rem from medical procedures. Most of the natural radiation dose comes from radon in homes. The individual radiation dose from natural radioactivity, medical procedures, and consumer products averages 360 mrem per person, which is 7,200 times the dose from SRS operations.

Releases of tritium account for greater than 50% of the offsite population dose from SRS atmospheric releases. Tritium from SRS is released in two forms to the atmosphere. The HT or elemental gas form is not readily absorbed in the human body while the HTO or oxide form (tritiated water) is readily assimilated. The dose from the elemental form is therefore significantly less than from the oxide form; the dose per unit of intake of tritium oxide is 25,000 times that of elemental tritium.

Before 1985, all tritium released from SRS to the atmosphere was considered to be in the oxide form. Reliable continuous measurements could not be taken prior to that year because SRS did not have the methodology to distinguish between elemental and oxide forms. In 1985, SRS incorporated technical advances to distinguish and measure tritium oxide and elemental tritium. Measurements of the forms of tritium released in 1988 showed that approximately 62% of the tritium released to the atmosphere from SRS operations was in the oxide form.

Dose Commitment from Liquid Releases

Consumption of water from the two water treatment plants on the Savannah River below SRS also contributes to the offsite dose commitment. The Cherokee Hill water treatment plant at Port Wentworth, GA (near Savannah, GA) provides water for industrial and manufacturing purposes. The 20,000 consumers of this water are primarily adults working in industrial facilities. The Beaufort-Jasper Counties, SC, water treatment plant provides water to 50,000 consumers of all ages living in Beaufort and Jasper Counties, SC. Approximately 92% of the radiation dose at the water treatment plants from SRS operations is due to tritium.

The radiation dose commitment to an individual downriver of SRS who consumed Savannah River water at a maximum rate of two liters a day was 0.13 mrem (0.0013 mSv) at both the Cherokee Hill water treatment plant at Port Wentworth, GA, and the Beaufort-Jasper water treatment plant. The dose commitment for an individual consuming the water at an average rate of one liter per day was 0.07 mrem (0.0007 mSv) for Beaufort-Jasper and 0.06 mrem (0.0006 mSv) for Port Wentworth.

The dose commitment to a hypothetical individual who could receive the highest offsite doses from releases of radioactivity from SRS to the Savannah River was 0.79 mrem (0.0079 mSv). This *maximum individual* would consume a maximum amount of water and a maximum amount of fish from the river just downriver from SRS and would also spend many hours in shoreline activities, swimming, and boating. This dose commitment of 0.79 mrem is only 0.3% of the annual dose commitment of 295 mrem (2.95 mSv) received from natural radiation sources.

The collective dose commitment from liquid releases in 1988 was 6 person-rem (0.06 person-Sv). The dose commitments from the water consumption pathway (Beaufort-Jasper and Port Wentworth) occur to discrete population groups; however, the dose commitments from other exposure pathways (i.e., fish and shellfish consumption and recreational activities) occur to a diffuse population that cannot be described as being in a specific geographical location.

Perspective

The radiation doses from SRS operations are small when compared with the dose from natural radiation, which averages 295 mrem (2.95 mSv) per year. The largest part of this natural dose is 200 mrem (2.00 mSv) from natural radon gas in homes. The maximum dose from SRS atmospheric releases of 0.5 mrem (0.005 mSv) is only 0.2% of the average dose from natural radiation.

The collective dose commitment (person-rem) from SRS releases can be compared with the population doses from natural radioactivity (cosmic radiation, terrestrial radioactivity, internal radioactivity, and radon in homes) and medical radiation exposure. The 1988 population dose commitment from SRS releases (21 person-rem from atmospheric releases and 6 person-rem from liquid releases) 0.02% of that from natural and medical sources. Even though the SRS contribution to population dose commitment is very small, SRS has a continuing program to improve operating techniques by integrating the principles of ALARA (As Low As Reasonably Achievable) and developing new technologies directed toward reducing releases of radioactive materials to the environment.

The radiation dose the public receives from nuclear operations at SRS can be viewed from several perspectives. In comparison to the EPA standard pertaining to atmospheric releases, the maximum individual dose at the SRS perimeter was 2.4% of the EPA limit. From the viewpoint of regulatory standards, the maximum radiation dose to consumers of water treated by the Port Wentworth and Beaufort-Jasper water treatment plants was 2.5% of the EPA standard. Compared to the exposure from natural radiation (295 mrem/year in the CSRA), the dose contributed by SRS operations is miniscule. Even the variation in the natural radiation dose in this area far exceeds the maximum offsite dose resulting from the Savannah River Site. In the context of the recommendations of the National Committee on Radiation Protection, any radiation dose less than 1 mrem (0.01 mSv) per year is so low that "further effort to reduce radiation exposure to the individual is unwarranted."

OVERVIEW OF 1988 MONITORING RESULTS

Magnitude of Program

The environmental monitoring program conducted at SRS is one of the largest and most comprehensive in the United States. A total of 211,500 analyses (113,500 radiological and 98,000 nonradiological) were performed in 1988. In addition, over 1.4 million nonradioactive measurements were made at ambient air quality monitoring stations and over 460,000 water quality readings were made in Beaver Dam Creek and Steel Creek.

While the radiological monitoring program has continued to experience some growth from year to year, the most pronounced growth has occurred in the nonradiological program. This program began expanding in the mid-1970s and has continued to escalate so that it is now as large as the radiological program. The major growth has occurred in groundwater monitoring.

Air Monitoring

Extensive monitoring for radioactivity in air is performed at six onplant stations, 13 plant perimeter stations, 12 stations at the 25-mile radius of SRS, and four stations at the 100-mile radius. The small amount of particulate alpha and beta-gamma radioactivity released to the atmosphere from SRS facilities is generally obscured in the area surrounding SRS by worldwide fallout. Tritium, the only radionuclide of plant origin routinely detected in offsite air, showed a decreasing trend with distance from the site. The average tritium concentration at the plant perimeter was 54 pCi/m^3, compared with 17 pCi/m^3 at the 25-mile radius and 12 pCi/m^3 at the 100-mile radius. The average onsite tritium concentration was 840 pCi/m^3.

Continuous measurements of the intensity of gamma radiation levels at 452 locations at and around SRS were made with thermoluminescent dosimeters (TLDs). In the unlikely event of a significant unplanned release of radioactivity, these TLDs would provide a quick and reliable method to determine external gamma radiation doses to population groups within an 8,000-square-mile area in the vicinity of SRS. Significant variability in environmental radiation is seen from one location to the other because of variable radioactivity in soil, rocks, and building material. As observed in previous years, there were no differences in 1988 between measurements taken at the site boundary and those taken as far as 100 miles away from SRS.

Atmospheric emissions of sulfur dioxide, oxides of nitrogen, and total suspended particulates from the five onsite coal-fired power plants were within applicable standards in 1988. All SRS stacks met the 40% opacity standard at all times except for the 291-F stack, which occasionally exceeded the standard. A number of renovations are underway to ensure 100% compliance by the 291-F stack. The quality of air at SRS was monitored at several locations around the site that measure total suspended particulates, sulfur dioxide, oxides of nitrogen, and ozone. The states of South Carolina and Georgia performed additional ambient air monitoring. All SRS monitoring results were within state standards.

Surface Water Monitoring

The Savannah River and streams located on SRS, are continuously sampled to monitor radioactivity released in effluent water from SRS facilities. Radioactivity in the liquid effluents is diluted by stream water, reactor heat exchanger cooling water, and Savannah River water. In 1988, no measurable differences were detected between upriver and downriver alpha and nonvolatile beta concentrations in the Savannah River. The release of tritium accounted for greater than 99% of the total radioactivity introduced into the Savannah River from SRS activities during 1988. After dilution by SRS streams and the Savannah River, tritium concentrations averaged 3.1 pCi/mL in the river below SRS at Highway 301, compared to 3.3 pCi/mL in 1987. The only radionuclide other than tritium detected in river water by routine analytical techniques was ^{90}Sr in trace quantities.

Using a special low-level analysis technique, the Savannah River Laboratory (SRL) detected ^{137}Cs both upriver and downriver of SRS. In 1988,the average ^{137}Cs concentrations determined by this technique were 0.014 pCi/L upriver and 0.065 pCi/L downriver of SRS. The difference between the upriver and downriver concentrations is attributed to releases from SRS operations. The maximum ^{137}Cs concentration of 0.123 pCi/L detected downriver of SRS was 1,500 times less than the EPA drinking water standard of 200 pCi/L.

Located approximately 20 miles from SRS, the Edisto River is minimally affected by SRS operations and is continuously sampled for radioactivity as a measure for comparison to concentrations in SRS streams. The maximum radioactivity concentrations detected in the Edisto River in 1988 were 1.9 pCi/L alpha, 3.4 pCi/L nonvolatile beta, and 750 pCi/L (0.75 pCi/mL) tritium.

The primary SRS stream with the highest concentration of radionuclides in 1988 was Four Mile Creek (FMC), which receives effluents from F- and H Areas, C-Reactor Area (although C Reactor was not operating in 1988) and migration from F- and H-Separations Areas seepage basins and the Radioactive Waste Burial Ground (RWBG). Alpha and nonvolatile beta concentrations in FMC were elevated with maximum activities of 6.5 pCi/L and 170 pCi/L, respectively. Tritium concentrations were also elevated with a maximum concentration of 2,900 pCi/mL.

A comparison of the amount of tritium released from SRS facilities in 1988 with the amount of tritium measured in transport in SRS streams and in the Savannah River continued to show relatively good agreement. Sources of tritium in liquid effluents include direct releases from site facilities (16% in 1988 compared with 20% in 1987) and migration of tritium from the Burial Ground, F-, H-, and P-Area seepage basins, and K-Area Containment Basin (84% in 1988 compared with 80% in 1987).

SRS liquid effluents are regulated by the South Carolina Department of Health and Environmental Control (SCDHEC) under the National Pollutant Discharge Elimination System (NPDES). In 1988, 71 active, permitted outfalls were monitored. SRS had a 99.8% NPDES compliance rate in 1988, compared to a 99.7% compliance rate in 1987. Only 14 of the 6,250 analyses performed exceeded permit limits.

The Savannah River is extensively monitored for chemicals, physical properties, and metals. Chemical and biological quality standards for the Savannah River are specified in the requirements of the state of South Carolina for Class B streams. All indications are that SRS operations do not have a deleterious effect on the Savannah River aquatic environment.

The Division of Environmental Research of the Academy of Natural Sciences of Philadelphia (ANSP) continued surveys of the aquatic environment and water quality of the Savannah River. Studies in 1988 included diatometer studies, aquatic insect surveys, and algal and aquatic macrophyte surveys. In addition, a comprehensive survey was conducted in the Savannah River in the vicinity of the Vogtle 1 Nuclear Power Plant.

Extensive monitoring of SRS streams indicates that, except for temperature in Pen Branch, the water quality is not adversely affected by SRS operations. Temperature profile surveys were conducted at the mouths and upriver of Beaver Dam Creek and Steel Creek as part of a comprehensive study of the thermal effects of SRS operations upon the waters of the state of South Carolina as stated in consent order 84-4-W between SCDHEC and DOE. During 1988, one temperature profile in both Beaver Dam Creek and Steel Creek was performed. All measurements were well within the consent order limits.

Groundwater Monitoring

SRS monitors groundwater quality to identify any contamination that may occur as a result of plant operations. Groundwater is monitored for the following purposes:

- to identify sources of contamination as soon as possible
- to measure concentrations of contaminants that may enter groundwater
- to provide data that can be used to design any needed cleanup projects

The SRS Environmental Monitoring Section, Environmental and Health Protection Department maintains the primary responsibility for installing monitoring wells, and for collecting and analyzing groundwater samples.

Monitoring of groundwater for radioactivity began in 1957. Monitoring groundwater for possible chemical or nonradioactive contaminants began in 1975.

Approximately 75 waste sites, operating facilities, and spill sites have monitoring wells. Nearly 900 wells were monitored in 1988 and around 100 new monitoring wells are being added to the monitoring system each year. Many wells are being installed to comply with environmental regulations.

Concentrations of chemicals, metals, and organics were generally within applicable standards except for total iron, total manganese, turbidity, and color at a few locations. Twelve of the 16 samples had elevated total iron concentrations above the South Carolina drinking water standard of 0.3 mg/L. These elevated iron concentrations are attributed to natural sources.

No confirmed positive concentrations of tetrachloroethylene, trichloroethylene, or 1,1,1-trichloroethane were detected in monthly analyses of drinking water from the A-Administration/M-Areas in 1988. The new 112- and 113-G Wells have also shown no confirmed chlorocarbon concentrations. Semiannual analyses of other drinking water supplies at SRS showed no confirmed chlorocarbons. Occasional low levels of trichloroethylene and tetrachloroethylene continued to be detected at the well head of 31A. The maximum concentrations for 1988 were 6.20 µg/L of trichloroethylene measured at well 31A was reported by ECS/Normandeau, a subcontracted offsite laboratory. Duplicate analysis of the sample by the 320-M laboratory measured 4.33 µg/L. Previously an A-Administration backup domestic water well, well 31A was removed from the domestic water line in November 1988. Process water wells 20A and 53A continued to show elevated chlorocarbon concentrations. The maximum concentration was 178µg/L of trichloroethylene detected in well 20A.

Environmental Monitoring of Other Media

Air and water are the principal dispersal media for SRS radioactive releases. However, the SRS environmental surveillance program also includes samples representing other segments of the environment that may be affected by these releases or that might provide pathways of radiation exposure to people.

Average concentrations of radioactivity routinely detected in milk, food, drinking water, wildlife, rainwater, soil, sediment, and vegetation in 1988 were generally within ranges observed during the last several years. Except for tritium, the concentrations observed were similar to those reported by other agencies in parts of the country not affected by SRS operations. Therefore, the occasional trace amounts of radioactivity detected in these samples are attributed to worldwide fallout from atmospheric nuclear weapons tests. In most cases tritium, when present, is attributed to SRS operations.

Annual hunts are conducted at SRS to control the deer and hog populations and to reduce onsite animal-vehicle accidents. All animals are monitored for radioactivity before being released to the hunters. The 1988 hunts yielded 855 deer and 146 hogs, as compared with 606 deer and 123 hogs in 1987.

All deer and hog results were within ranges observed over the last several years and consumption of the meat from these animals presents no radiation hazard. The average ^{137}Cs concentration in SRS deer monitored in 1988 was 10.2 ± 11 pCi/g. The 50-year dose commitment to an individual who consumed one 8 oz. steak of deer meat with this concentration would be 0.11 mrem. This dose is 0.11% of the DOE Revised Interim Dose Limit from prolonged exposure.

The 50-year dose commitment received from consuming food with radioactive concentrations, is directly proportional to the amount of food consumed. For instance, if the same person were to eat one 8 oz. steak which contained a concentration of 10.2 pCi/g ^{137}Cs every day for one year, he would receive a 50-year dose commitment of 41 mrem. This dose is 41% of the DOE Revised Interim Dose Limit from prolonged exposure and 14% of the average CSRA resident's average annual dose from naturally occurring radioactivity. The deer with the highest concentration, 60 pCi/g, had edible meat which weighed approximately 13.6 kg and contained approximately 0.82 mCi of ^{137}Cs. An adult consuming all of this meat would receive a 50-year radiation dose commitment of 40 mrem (0.40 mSv) or 40% of the DOE Revised Interim Radiation Dose Limit from a prolonged period of exposure. This dose would also be 13.6% of the average CSRA resident's annual dose from naturally occurring radioactivity. This deer to person exposure pathway has the greatest potential for the highest 50-year dose commitment; however the actual amount of ^{137}Cs in deer contributed by SRS operations compared to worldwide fallout is under investigation.

Special Surveys and Studies

Results of special comprehensive radiological surveys of Upper Three Runs Creek, Lower Three Runs creek, R Area, and R-Area Old and New Canal were reported in 1988. Environmental samples analyzed included soil, sediments, vegetation, timber, stream water, and fish as appropriate. Measurements of environmental gamma radiation were also made during these surveys.

Additionally special radiological surveys were conducted in the environment when short-term tritium releases occurred on eight occasions (four atmospheric and four liquid to streams) in 1988. The maximum calculated dose to an individual at the site boundary from the largest release was 0.2 mrem (0.002 mSv) when 3,500 Ci of tritium was released to the atmosphere on December 7, 1988.

Special surveys were also conducted on eight other occasions in 1988 when short-term radioactivity releases (five atmospheric and three liquid to streams) occurred. The maximum atmospheric activity release was 83 mCi of ^{238}Pu released in October 1988 from a laboratory facility. The contamination was confined to a 200 ft radius of the building exhaust stack and all site environmental samples were within normal activity levels. The maximum liquid to stream release was 27 mCi of ^{137}Cs on July 8, 1988 from the H-Area Retention Basin to Four Mile Creek. Elevated cesuim concentrations were measured in Four Mile Creek; however ^{137}Cs concentrations measured in the Savannah River remained within previously observed levels both during and after the release.

Savannah River Swamp Survey. Monitoring of five square miles of swamp bordering the Savannah River below the SRS boundary continued to indicate radioactivity (previously identified as ^{60}Co and ^{137}Cs) above natural background levels. The offsite swamp area is uninhabited and inaccessible except for possible occasional hunting or fishing. A comprehensive survey along 10 sampling trails that traverse the swamp was conducted in 1985 before the startup of L Reactor. Cursory surveys performed in 1986 and 1988 indicated the following radiological conditions:

- Gamma radiation measurements were within ranges observed in previous years. The maximum radiation measurement was 0.88 mR/day.
- Radionuclide concentrations in soil and vegetation samples were within ranges observed in previous years.
- Concentrations of ^{137}Cs in fish collected from two lakes near the swamp trails were within ranges observed in previous years.

Spills. A site-wide procedure requires prompt reporting of oil and chemical spills to a spill coordinator who ensures spills are reported to the Department of Energy (DOE), Environmental Protection Agency (EPA), and South Carolina Department of Health and Environmental Control (SCDHEC) as appropriate to satisfy regulatory requirements. In 1988, there were 155 minor spills reported to the spill coordinator. Most of these were minor spills of petroleum products. None of the spills were reportable under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). There have been two CERCLA reportable spills in 1989.

ENVIRONMENTAL MANAGEMENT AND RESEARCH PROGRAMS

A wide variety of environmental management and research programs are conducted at the SRS each year by the Savannah River Site (SRS), Savannah River Laboratory (SRL), Savannah River Ecology Laboratory (SREL), and the Savannah River Forest Station (SRFS). Highlights of a few of the programs are discussed in the following paragraphs. A listing of SRS environmental highlights is attached as Appendix B.

SAVANNAH RIVER SITE ENVIRONMENTAL MANAGEMENT PROGRAM

Environmental Implementation Plan

The Savannah River Site (SRS) has developed a comprehensive Environmental Implementation Plan (EIP) that sets specific site environmental policies, objectives, and implementation strategies for the next five years. The EIP provides an integrated approach to SRS environmental programs. The plan outlines specific programs to maintain air quality, prevent surface water and groundwater contamination, manage waste handling and disposal, and protect wildlife. The site's environmental program manpower and budget requirements are also established by the EIP.

NESHAP Issues

The Savannah River Site reviewed and prepared comments on the Environmental Protection Agency (EPA) proposed rule-making for benzene under Section 112 of the Clean Air Act. Benzene was the first chemical proposed for National Emissions Standards for Hazardous Pollutants (NESHAP) regulation in which EPA must weigh health effects above cost in setting air standards. The rule was expected to have major implications for subsequent NESHAPs standards, most notably for radionuclides.

A NESHAP Radionuclide Compliance Manual was drafted during 1988. The purpose of this manual is to provide guidance to SRS operations on regulation requirements, administrative procedures that will enhance regulatory compliance, and technical guidance in preparing applications for EPA approval. The manual was scheduled to be issued in 1989.

Because of NESHAP regulation requirements for new facilities that have radioactive emissions, several new facilities at SRS were required to have a permit for construction and operation. SRS applied to EPA for approval to construct and operate these new facilities. SRS received the construction and operation NESHAP approval for the F- and H-Area Effluent Treatment Facility (ETF) in March 1988. EPA issued the construction and operation NESHAP approvals for the Defense Waste Processing Facility (DWPF) and Replacement Tritium Facility (RTF) in April and May 1988, respectively. Conditional approval was received from EPA in September 1988 for the construction and operation permit for the Uranium Solidification Facility (USF). A NESHAP application was prepared and given to DOE in September 1988 for the proposed Consolidated Incineration Facility.

Waste Site Closure

Fourteen nonhazardous waste management units were closed prior to 1989 as required by SCDHEC. During 1988, seven nonhazardous waste sites were closed and plans for closing 12 nonhazardous sites were approved.

Completion of the M-Area Settling Basin and Lost Lake closure is scheduled for 1989. Closure plans for the F- and H-Area Hazardous Waste Management Facilities were submitted to SCDHEC and are awaiting approval.

The Postclosure Care Permit Application for the F- and H-Area Hazardous Waste Management Facilities is being developed. Closure plans are being written for the Metallurgical Laboratory Basin, the F-, H-, K-, and P-Area Acid/Caustic Basins, the new TNX Seepage Basin, and four Savannah River Laboratory Seepage Basins.

A Memorandum-to-file (MTF) for the Mixed Waste Management Facility Closure was issued in November 1988. The MTF satisfies the NEPA documentation requirements by including closure details not covered in the EIS, "Waste Management Activities for Groundwater Protection at SRS." The MTF will serve as the example for completing NEPA requirements in other waste site closures.

SAVANNAH RIVER LABORATORY, SAVANNAH RIVER SITE ENVIRONMENTAL MANAGEMENT AND RESEARCH PROGRAMS

1988 Radiometric Analyses of SRS and Plant Vogtle Effluents in the Savannah River

Trace radionuclide concentrations in the Savannah River are continually studied to distinguish between the effluent contaminants from SRS and the Georgia Power Company Plant Vogtle nuclear reactor. During 1988, radionuclide concentrations of these effluents were well below DOE guide values. The largest gamma component in the Vogtle effluent was ^{58}Co and its maximum concentration was 15.5 pCi/L, far below the DOE guide of 40,000 pCi/L. The maximum radionuclide concentrations in the SRS effluents were 3,000 pCi/L tritium and 0.4 pCi/L ^{137}Cs, also well below the DOE guide levels of 2,000,000 pCi/L tritium and 3,000 pCi/L ^{137}Cs. These low-level radiometric studies continue to provide early detection to avoid potential hazards.

The radionuclide concentrations in the river are appraised using several methods. Previously the most sensitive method was to collect samples on resins for about two weeks and then count them overnight on High Purity Germanium (HPGe) and Sodium Iodide [NaI(Tl)] detectors in the ETD Underground Counting Facility (UCF). Periodic sediment samples were also counted in this fashion. A more real-time sampling mode has involved consecutive one-day counts with an underwater NaI(Tl) detector located on the ETD monitoring platform at Highway 301 bridge; the activities measured by this underwater detector are in good agreement with those from the resin samples. Tritium concentrations were measured with a low-level liquid scintillation counter.

The results indicate that Plant Vogtle effluents primarily contain only neutron activation products (^{51}Cr, ^{54}Mn, ^{57}Co, ^{58}Co, ^{59}Fe, ^{60}Co, ^{95}Zr, and ^{95}Nb). The SRS effluents primarily contain a small amount of tritium and a single fission product, ^{137}Cs.

Geographical Information System

United States Geological Survey (USGS) map data bases are being installed for use with the new Geographic Information System (GIS). The GIS will link these map data with output from the emergency response codes. Coupling of the data will provide and display information on population distribution and dose, road networks, routing and location of emergency response vehicles, land use, topography, and maps of the impact regions.

Microbial Life in the Terrestrial Subsurface of Southeastern Coastal Plain Sediments

The distribution and function of microorganisms are vital issues in microbial ecology. A DOE program, "Microbiology of the Deep Subsurface," concentrates on establishing fundamental scientific information about organisms at depth. This investigation was initiated at SRS with the drilling of three microbiological boreholes in 1986. A fourth borehole was drilled in cooperation with the SCWRC south of the site in 1988. This boring extended the depth of investigation to greater than 1,700 ft. The findings of this program have direct implications for a variety of subsurface activities, including bioremediation.

Approximately 2,000 new and different species (principally bacteria) have been isolated as deep as 800 ft beneath the soil's surface. SRS plans to make these organisms available to U.S. industry for possible new product development under technology transfer.

The diversity of the microbiological communities in deep terrestrial sediments is one of the most striking discoveries of this study. A wide and diverse variety of metabolically active micro-organisms capable of transforming a spectrum of organic and inorganic compounds were present. These sediments contained many types of aerobic chemoheterotrophic bacteria, as well as a wide assemblage of other forms.

The diversity of platable forms decreased sharply with depth in shallow aquifers, but this was not the case in the deeper sediments studied at SRS. Such differences are surprising for a presumably nutrient-limited environment, and contrary to the traditional thinking in soil microbiology. In this study, the diversity was not limited by depth, however, such limitation was observed where the concentration of clays was greater than 20%. Such zones may not be drastically different, but because they contain fewer microorganisms than the more transmissive sand zones, they were not readily evaluated for diversity.

Additionally, this investigation has isolated an extensive number of bacteria which may be new to the scientific community and may provide investigators with a new source of genetic material from organisms adapted to living and metabolizing hundreds of meters below the earth's surface.

The "Microbiology of the Deep Subsurface" program is an initiative that has demonstrated the presence of numerous, active, and diverse microorganisms associated with the sediments of the terrestrial deep subsurface. The understanding of the microbiology of the deep terrestrial environment is not only an important advance for the sciences of microbial ecology, geomicrobiology, and geology, but has great applicability to a variety of industrial and governmental concerns, (e.g., fossil fuel recovery and storage, deep waste repositories, groundwater storage and retrieval, biologically produced products and transformations, as well as transport and fate of groundwater contaminants). This investigation opens new avenues for research and fundamental investigations into the interaction between the biosphere and the geosphere.

Sitewide Seismic Survey

All data acquisition using the Conoco seismic crew is complete, with data processing and analysis complete. The faults previously identified on only one seismic line were also located on the recent data, so their locations have been defined. Three exploratory borings, along with a complete suite of electric logs, were completed into the basement rock. The cores from these borings were geologically logged in detail. These are the first borings cored into bedrock at SRS since the early 1960s. *In-situ* stress measurements were made in two of the three new borings and in DRB 8, one of the deep borings from the 1960s. Results indicate horizontal stresses are higher than vertical stresses. The estimated magnitude and direction of stress appears consistent with other measurements made in the state.

The Seismic Advisory Committee was finalized and the committee met once in the fall of 1988. The committee was established to provide additional independent overview and guidance to management on seismic issues relevant to SRS and its operations. On August 5, 1988, a small earthquake (local magnitude 2.0) occurred south and east of the location of the 1985 earthquake. Earthquakes of this magnitude and intensity are usually not felt and are detected only by instruments. Within the southeastern U.S., approximately 40 earthquakes per year of this magnitude are recorded by seismographic networks. About 10 events of this size are recorded in South Carolina each year. This event was not felt on site and the seismic alarms in site facilities were not triggered.

NATIONAL ENVIRONMENTAL RESEARCH PARK PROGRAM

The National Environmental Research Park (NERP) program was established in 1972 to use the SRS as an outdoor laboratory for studies of the environmental impact of human activities. During 1988, approximately 10 NERP program research projects were conducted, with baseline studies providing information on wetland bacteria of Okefenokee Swamp, GA, wading birds' feeding behavior, and the cesium-binding capacity of the Savannah River Site.

SAVANNAH RIVER ECOLOGY LABORATORY PROGRAMS

Genetic Survey of the Endangered Red-Cockaded Woodpecker

A small population of the endangered red-cockaded woodpecker exists on the SRS. This population has declined steadily since monitoring began in 1977, and reached a low of four individuals in 1985. Research was initiated at that time to investigate the factors responsible for the population's decline and to determine the steps necessary to restore a viable population of red-cockaded woodpeckers at the SRS. A genetic survey was conducted from 1985 to 1987 to:

- compare levels of genetic variability of the red-cockaded woodpecker on the SRS to those of populations elsewhere in the south
- investigate the relationship between population size, genetic variability, and physical fitness
- develop guidelines for translocation of red-cockaded woodpeckers onto the SRS based on genetic structure of populations in the south

Results of this survey indicate that, relative to other populations, the red-cockaded woodpeckers on the SRS exhibit normal levels of heterozygosity, but slightly lower percent polymorphic loci and mean number of alleles per locus (measurements indicative of genetic variability). This slight decrease likely reflects the recent decline in the number of individuals present in the population. There is no indication of reduced fitness level in the SRS population. Finally, the wide scale genetic survey indicates that red-cockaded woodpecker populations exhibit a greater degree of genetic variability among populations than other birds which have been studied. This suggests that caution must be used in moving birds among populations, so as not to disrupt locally adapted populations. Thus, birds chosen for introduction onto the SRS are best chosen from populations occupying similar habitats in close geographic proximity to the SRS.

U.S. FOREST SERVICE SAVANNAH RIVER FOREST STATION PROGRAMS

During 1988, the federal government received nearly $2 million for 22.9 million board feet of cut timber from the SRS. Pine seedlings were planted on nearly 2,700 acres during the same period. Nearly nine miles of secondary roads used for the timber harvest were upgraded to handle large trucks used for hauling tree-length sawtimber and pulpwood. Routine road maintenance was performed on 120 miles of roads.

Southern bald eagles nested at SRS for the third consecutive year; three young were fledged successfully during 1988. Selected trees within six Eagle Management Key Areas were shaped and modified to provide perching and nesting sites. To protect forests, roads, and research sites, 326 wild hogs were trapped and removed from locations where they were causing damage. During 1988, 48 field studies involving over 20,000 trees of longleaf pine, loblolly pine, sweetgum, and black walnut were active at the SRS.

ACKNOWLEDGMENT

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APPENDIX A

ENVIRONMENTAL PERMITS

Permit Number	Type	Title
0080-0060-CF	AIR	1000 KW Emergency Diesel Generator, 654-1T
0080-0060-CE	AIR	300 KW Emergency Diesel Generator, 654-T
0080-0066-CA	AIR	2000 KW Emergency Diesel Generator, 292-S
0080-0042-CA	AIR	400 KW Emergency Power Diesel Generator, 773-A
0080-0045-CA	AIR	200 KW Emergency Diesel Generator, 254-5F #1
0080-0045-CA	AIR	175 KW Emergency Diesel Generator, 772-F #1
O/P-02-285	AIR	Uranium Dissolution, 221-F (Pending Enforcement Action Resolution)
0080-0045-CH	AIR	350 KW Emergency Diesel Generator, 241-19F
0080-0045-CD	AIR	315 KW Emergency Diesel Generator, 221-FB
0080-0045-CA	AIR	415 KW Emergency Diesel Generator, 772-1F
0080-0045-CF	AIR	300 KW Emergency Power Diesel Generator, 254-9F
0080-0046-0	AIR	400 LBS/HR Type "O" Waste Incinerator, Baghouse and Hepa Filters (Beta-Gamma Incinerator)
0080-0046-CA	AIR	300 KW Emergency Power Diesel Generator, 221-HB
0080-0046-CC	AIR	1000 KW Emergency Power Diesel Generator, 221-H
0080-0047-CA	AIR	225 KW Emergency Power Diesel Generator
0080-0055-CB	AIR	400 Gallon/Minute Air Stripper
0080-0066-CD	AIR	84 Ton/Hr Cem Storage Silo, Baghouse
0080-0060-CA	AIR	300 KW Emergency Power Diesel Generator, 673-T
0080-0060-CC	AIR	300 KW Emergency Power Diesel Generator, 672-T
0080-0060-CB	AIR	20 LBS/HR Shirco incinerator, Hepa Filters, 677-T
0080-0060-CD	AIR	Process to Decompose Tetraphenylborate into Aqueous and Organic Portions, 682-T
0080-0046-CJ	AIR	455 KW Emergency Diesel Generators, 720-H
0080-0046-CG	AIR	765 KW Emergency Power Diesel Generator, 233H
0080-0046-CD	AIR	Alt Tanks 48H and 49H (In-Tank Precipitation Air Quality Control Permit)
0080-0046-CE	AIR	150 KW Emergency Power Diesel Generator, 241-96H
0080-0046-CF	AIR	1000 KW Emergency Power Diesel Generator
0080-0046-CH	AIR	Fuel Processing Facility (FPF) with Hepa Filters
0080-0046-CI	AIR	400 and 500 KW Emergency Power Diesel Generators, 254-8H, 254-9H
0080-0042-CC	AIR	455 KW Emergency Diesel Generators, 720-2A
0080-0042-CB	AIR	250 KW Emergency Power Diesel Generator
0080-0042-CA	AIR	150, 400, 200 KW Emergency Power Diesel Generators, 703-A, 503-2A, 751-A
0080-0042-CB	AIR	250 KW Diesel Driven Electric Driven Generator, 754-4A
0080-0045-CI	AIR	FMF Cement and Flyash Silos and Baghouse
0080-0045-CJ	AIR	455 KW Emergency Diesel Generators, 720-F
0080-0066-CC	AIR	187 KW Emergency Power Diesel Generator, 980-S
0080-0047-CA	AIR	225 and 365 KW Emergency Power Diesel, 105-K, 183-K

ENVIRONMENTAL PERMITS (Contd)

Permit Number	Type	Title
0080-0080-CG	AIR	Silo to Store Cement, with Baghouse
0080-0080-CA	AIR	425 KW Emergency Power Diesel Generator
0080-0048-CA	AIR	225 and 365 KW Emergency Power Diesel Generators, 105-L, 183-2L
P/C-02-358	AIR	Fuel Materials Facility (FMF) (Inc. Batch Mixer Vent Emissions)
P/C-02-359	AIR	FMF Waste Treatment Facility
P/C-02-360	AIR	1483 KW Emergency Diesel Generator
P/C-02-364	AIR	Batch Process Filtration Unit and Scrubber
0080-0043-CA	AIR	225 and 365 Emergency Power Diesel Generators, 105-C, 183-2C
0080-0055-CA	AIR	50 GPM Air Stripper
0080-0066-CB	AIR	DWPF Vitrification Process, 221-S
0080-0079-0	AIR	180 KW Emergency Power Diesel Generator, Atta Facility
0080-0080-CB	AIR	Three Fly Ash Silos with Baghouse
0080-0080-CC	AIR	Weigh Hopper with Baghouse
0080-0080-CD	AIR	Two Premix Air Blenders with Baghouse
0080-0080-CE	AIR	Premix Feed Bin with Baghouse
0080-0055-CC	AIR	200 KW Emergency Power Diesel
0080-0045-CB	AIR	175 KW Emergency Diesel Generator, 772-F #2
0080-0080-CH	AIR	Substitute Slag for Cement to be stored in Silo (Z-Area, Modification to 0080-0080-CA)
0080-0080-CJ	AIR	Low Point Drain Tank Vent with Hepa Filter (Z-Area)
0080-0080-CI	AIR	Modification of Permit 0080-0080-CF to Include VOC Emissions From Stack (Z-Area)
0080-0042-CB	AIR	200 KW Emergency Power Diesel Generator, Bldg. 254-5F #2
0080-0080-CF	AIR	Grout Mixer with Baghouse
P/C-02-361	AIR	Nine Finishing Processes for FMF
0080-0045-CH	AIR	350 KW Emergency Power Diesel Generator
O/P-02-271	AIR-VOID	71.7 MMBTU/HR Coal Boiler #1, Cyclones, 284-F
O/P-02-272	AIR-VOID	71.7 MMBTU/HR Coal Boiler #2, Cyclones, 284-F
O/P-02-273	AIR-VOID	71.7 MMBTU/HR Coal Boiler #3, Cyclones, 284-F
O/P-02-274	AIR-VOID	71.7 MMBTU/HR Coal Boiler #4, Cyclones, 284-F
0080-0045-CE	AIR-VOID	600 KW Emergency Power Diesel Generator, 221-F
0080-0066-CA	AIR-VOID	270 CU YDS/HR Concrete Batch Plant
0080-0045-CD	AIR-VOID	315 and 1025 KW Emergency Diesel Generator, 292-2F
N/A	AIR-VOID	12 LBS/HR Pilot Plant Incinerator
0080-0080-CA	AIR-VOID	Storage Silo and Baghouse, 425 KW Emergency Power Diesel Generator

ENVIRONMENTAL PERMITS (Contd)

Permit Number	Type	Title
LS-233-W	DOMESTIC WATER	Temporary Domestic Water for F/H ETF Construction Office
LS-232-W	DOMESTICWATER	Temporary Domestic Water for FPF & RTF Facilities
404618	DOMESTIC WATER	705-C Domestic Water
404608	DOMESTIC WATER	717-K Domestic Water
204198	DOMESTIC WATER	Replace Domestic Deepwell, 905-66H
204138	DOMESTIC WATER	Replace Domestic Deepwell, 905-94K
203638	DOMESTIC WATER	Replace Allendale Barricade Well
203628	DOMESTIC WATER	Replace Pistol Range Well
LS-238-W	DOMESTIC WATER	ECF/CAS Security Upgrade Facilities, H-Area
200279	DOMESTIC WATER	Install Domestic Deepwell 905-120-P (Well - P-Area)
401118	DOMESTIC WATER	Domestic Water for NWTF
LS-178-W	DOMESTIC WATER	Computer Repair Building Domestic Water, 722-5A
203427	DOMESTIC WATER	Sodium Hypochlorite System, 280-F
203467	DOMESTIC WATER	Sodium Hypoclorite System, 280-H
LS-187-W	DOMESTIC WATER	ETF-F Lift Station Domestic Water
411357	DOMESTIC WATER	ETF-H Lift Station Domestic Water
LS-185-W	DOMESTIC WATER	Domestic Water Main, 901-A
205217	DOMESTIC WATER	Upgrade Instrumentation 280-1, F/H Areas
405556	DOMESTIC WATER	Domestic Water System, 200-H
LS-54-W	DOMESTIC WATER	Domestic Water Line, 707-H
212745	DOMESTIC WATER	DWPF Domestic Water Wells 1 and 2
402186	DOMESTIC WATER	DWPF Domestic Water Distr. System
401446	DOMESTIC WATER	Production Control Facility for 200 Area Process 772-1F
408285	DOMESTIC WATER	Domestic Water Service for Sanitary Waste Treatment Facility, TNX
LS-23-W	DOMESTIC WATER	DWPF TC Emergency Water Supply
203786	DOMESTIC WATER	Drinking Water Well 905-114G, 681-3G
LS-43-W	DOMESTIC WATER	Technical Area Water Main Bypass, 773-14A
411995	DOMESTIC WATER	Water Distribution System, 340-M, 341-M
LS-82-W	DOMESTIC WATER	Domestic Water for Sanitary Treatment Facility, U-Area
LS-81-W	DOMESTIC WATER	Domestic Water for Construction Office Bldg., C Area
LS-56-W	DOMESTIC WATER	Domestic Water Supply for Chemical Feed Facilities In G&H Areas (H)
LS-55-W	DOMESTIC WATER	Domestic Water Supply for Chemical Feed Facilities In G&H Areas (G)
LS-61-W	DOMESTIC WATER	Domestic Water Line to feed DWPF Sanitary Treatment Plant
LS-60-W	DOMESTIC WATER	Domestic Water Line for 704-S Administration Bldg. DWPF
LS-57-W	DOMESTIC WATER	Domestic Water Line Relocation & Service Line Install, Bdg. 735-11A
41225	DOMESTIC WATER	3/700 A-Area Water Line from New Domestic Wells
208866	DOMESTIC WATER	Domestic Water Well for Aiken Barricade Gate House (701-5G)

ENVIRONMENTAL PERMITS (Contd)

Permit Number	Type	Title
400347	DOMESTIC WATER	Domestic Water Headers, TNX Area
LS-115-W	DOMESTIC WATER	Water Line, Crafts & Engineers, CAB/Central Shop
LS-106-W	DOMESTIC WATER	DWPF Auxiliary Pump PIT Water Lines, S-511
410406	DOMESTIC WATER	Drinking Water System, 777-A
210657	DOMESTIC WATER	Drinking Water Well And Distribution System, 905-39F
LS-139-W	DOMESTIC WATER	Replacement Tritium Facility Domestic Water, 233-H, 249H
400367	DOMESTIC WATER	Fuel Production Facility Water System, 225H
111626	DOMESTIC WATER	Upgrade Gaseous Chlorination Facility, D/G Areas
406137	DOMESTIC WATER	Interim Storage and Redrumming FAC., Domestic Water, 709-1G, 709-2G
LS-118-W	DOMESTIC WATER	Water Line, 719-4A
LS-119-W	DOMESTIC WATER	Water Line, 730-M
400737	DOMESTIC WATER	Water Line, DWPF, Z-Area
205877	DOMESTIC WATER	Augusta Barricade Water Well, 905-116G
405566	DOMESTIC WATER	Domestic Water System, 200-F
208425	DOMESTIC WATER	Atta Domestic Water System
LS-25-W	DOMESTIC WATER	Chemical Feed Facility Water System, 100-C
408595	DOMESTIC WATER	Domestic Water Line, Construction Office Building, 300-M
409955	DOMESTIC WATER	Helicopter Facility Domestic Waterline
207005	DOMESTIC WATER	Activated Carbon Treatment System, 3/700 Area
LS-59-W	DOMESTIC WATER	Water System, DWPF Ice House
402925	DOMESTIC WATER	DWPF Temporary Domestic Water
206575	DOMESTIC WATER	Domestic Water Deepwells and Distribution Line, A-Area
201715	DOMESTIC WATER	Domestic Deepwell, Railroad Classification Yard, 905-107G
209454	DOMESTIC WATER	TNX Domestic Water System and Well
409484	DOMESTIC WATER	Water Line, Reactor Simulator Facility, 707-C
LS-11-W	DOMESTIC WATER	Water Line, Naval Fuels Mater Facility, 247-F
LS-7-W	DOMESTIC WATER	Water Line, Naval Fuels Mater Facility, 221-17F, 221-18F
LS-8-W	DOMESTIC WATER	Water Line, 703-4A, 703-6A, 703-34A
208434	DOMESTIC WATER	Domestic Water System, Barricades, 701-8G, 701-12G, 701-13G
202915	DOMESTIC WATER	Water Supply and Well System, DWPF Construction Support Area
402874	DOMESTIC WATER	Segregated Domestic Water Supply, 300/700 Area, Phase I
403434	DOMESTIC WATER	Segregated Domestic Water Supply, 300/700 Area, Phase II
48061	DOMESTIC WATER	Temporary Water System, 905-104L, 904-105L
200092	DOMESTIC WATER	Deep Wells, 905-104L, 904-105L
LS-4-W	DOMESTIC WATER	Water Line, Office Bldg., 703-41A
LS-1-W	DOMESTIC WATER	Water Line, Tritium Facilities Support Bldg., 235-H

ENVIRONMENTAL PERMITS (Contd)

Permit Number	Type	Title
405184	DOMESTIC WATER	Water Line, 773-41A, 773-42A
412917	DOMESTIC WATER	Drinking Water System, ETF, 241-84H, 241-81H
208177	DOMESTIC WATER	Phosphate Feed System, B-Area
LS-265-W	DOMESTIC WATER	Domestic Water Supply for Equipment Storage & Health Protection (HP) Facility 221-25F (F-Area)
LS-264-W	DOMESTIC WATER	Central Shops Construction Div. Quality Office Bldg.
411337	DRINKING WATER	Install Sodium Hypochlorite System, 780-A
IWP-219	IND. SOLID WASTE	200-F Erosion Control Site
IWP-211	IND. SOLID WASTE	200-H Erosion Control Site
IWP-210	IND. SOLID WASTE	D-F Steamline Erosion Control Site
IWP-087A	IND. SOLID WASTE	Sanitary Landfill Expansion
IWP-212	IND. SOLID WASTE	Coal-Ash Waste Landfill, 100-P Area
IWP-217	IND. SOLID WASTE	Z-Area Saltstone Disposal Facility (Solid Waste) - Modification
IWP-175	IND. SOLID WASTE	Experimental Sewage Sludge Application Sites (Road F, 1953 Sandy, Kato Road, Par Pond, K-Area, 40 Acre Hardwood, Lower)
13,734	IND. WASTEWATER	Industrial Wastewater pH Control System, 211-H
13,735	IND. WASTEWATER	Industrial Wastewater PH Control System, 211-F
13,978	IND. WASTEWATER	TNX ION Exchange Facility
13,286	IND. WASTEWATER	Portable Chromium Removal System, SRL
14,068	IND. WASTEWATER	M-Basin Closure Wastewater Treatment Facility (M-Area Basin)
14,020	IND. WASTEWATER	Mercury and Organic Removal Facility for F&H ETF
14214	IND. WASTEWATER	Batch Mixer System-FMFWastewater Treatment Facility Mod.
14,379	IND. WASTEWATER	Upper Three Runs Creek Diffuser (For F&H ETF - Outfall H-016)
14218	IND. WASTEWATER	NPDES Outfall Structures F-012 & F-013 (Flow Monitoring Weir Box Structures)
14219	IND. WASTEWATER	NPDES Outfall Structures H-017 & H-018 (Monitoring Weir Box Structures)
14520	IND. WASTEWATER	F&H ETF Tank 50 As-Built
14,100	IND. WASTEWATER	Repair Ash Basin Dike 488-1D
13,457	IND. WASTEWATER	L-Tank Mercury Removal
12,773	IND. WASTEWATER	L-Lake Thermal Barrier Curtain
12,683	IND. WASTEWATER	Z-Area Saltstone MFG. FAC.
12,782	IND. WASTEWATER	Replacement Tritium Facility Process Sewer
LS-186-S	IND. WASTEWATER	FPF Process Sewer Line
13,105	IND. WASTEWATER	ETF Process Sewer Lines, F/H-Area
13,154	IND. WASTEWATER	Flow Measurement Device, L Area
12,922	IND. WASTEWATER	Naval Fuel Facility Modifications
12,894	IND. WASTEWATER	Filtrate Hold Tank Covers, M Area

ENVIRONMENTAL PERMITS (Contd)

Permit Number	Type	Title
12,870	IND. WASTEWATER	Effluent Treatment Facility - F/H Area (ETF)
12,622	IND. WASTEWATER	Organics Removal Facility, TNX
12,633	IND. WASTEWATER	Effluent Treatment Plant, TNX (ETP)
11,413	IND. WASTEWATER	DWPF Chemical Treatment Facility, S-Area
11,411	IND. WASTEWATER	DWPF Treated Effluent Line
11,588	IND. WASTEWATER	Powerhouse Effluent Diversion to Ash Basins, D/H Areas
11,589	IND. WASTEWATER	Powerhouse Effluent Diversion to Ash Basins, K & P Areas
12,888	IND. WASTEWATER	Metallurgical Laboratory Neutralization Facility, 723-A
10,389	IND. WASTEWATER	M-Area Drain Line
10,469	IND. WASTEWATER	735-11A Lab Bldg. Process Sewer System Neutralization Facility
10,358	IND. WASTEWATER	S-Area Oil Separator
10,253	IND. WASTEWATER	M-Area 330 GPM Air Stripper
9886	IND. WASTEWATER	M-Area 50 GPM Air Stripper
10,349	IND. WASTEWATER	672-T TNX Process Sewer to Outfall X-008
10,949	IND. WASTEWATER	Trade Waste Flow Equalization Tank, 607-18A
10,920	IND. WASTEWATER	SREL Wastewater Disinfection Facility
10,765	IND. WASTEWATER	Wastewater Neutralization Facility, 704-U
11,497	IND. WASTEWATER	Production Control Facility Sanitary/Process Sewer, 772-1F
11,406	IND. WASTEWATER	Fire Brigade Training Facilities Oil Separator, 411-D
11,971	IND. WASTEWATER	Carbon Bed Piping for Organics Removal Demonstration Proj.-TNX
11,498	IND. WASTEWATER	Flow Monitoring Station for NPDES Outfall - L-007
13,354	IND. WASTEWATER	D-Area Neutralization Facility, 483-1D
13,355	IND. WASTEWATER	F-Area Neutralization Facility, 280-1F
13,356	IND. WASTEWATER	H-Area Neutralization Facility, 280-H
13,357	IND. WASTEWATER	K-Area Neutralization Facility, 183-2K
12,973	IND. WASTEWATER	P-Area Neutralization Facility, 183-2P
LS-112-S	IND. WASTEWATER	Fire Training Facility Process Sewer, 904-D
11,760	IND. WASTEWATER	Wastewater For PCB Clean-Up, 320-M
10,696	IND. WASTEWATER	Interim Sludge Storage Tank, M-Area
LS-42-S	IND. WASTEWATER	Inert L Facility Loading Dock Sewer Relocation, 234-H
10,955	IND. WASTEWATER	DWPF Concrete Batch Plant Wastewater Treatment Pond, S Area
10,778	IND. WASTEWATER	Wastewater Treatment Facility, Naval Fuel (FMF)
10,475	IND. WASTEWATER	Non-Contact Cooling Water Diversion, 300-M Area
9974	IND. WASTEWATER	Concrete Batch Plant, S-Area
10,287	IND. WASTEWATER	Liquid Effluent Treatment Facilities, 300-M (LETF)
7289	IND. WASTEWATER	"As Built" Wastewater Treatment Facilities, A and M Areas

ENVIRONMENTAL PERMITS (Contd)

Permit Number	Type	Title
7290	IND. WASTEWATER	"As Built" Wastewater Treatment Facilities, F-Area
7291	IND. WASTEWATER	"As Built" Wastewater Treatment Facilities, H-Area
7292	IND. WASTEWATER	"As Built" Wastewater Treatment Facilities, P-Area
7293	IND. WASTEWATER	"As Built" Wastewater Treatment Facilities, K-Area
7294	IND. WASTEWATER	"As Built" Wastewater Treatment Facilities, C-Area
7295	IND. WASTEWATER	"As Built" Wastewater Treatment Facilities, D-Area
7296	IND. WASTEWATER	"As Built" Wastewater Treatment Facilities, CS Area
13,431	IND. WASTEWATER	Flume at M-004 Outfall
13,456	IND. WASTEWATER	L-Tank "As Built"
SC 88-D-005	IND. WASTEWATER	F/H ETF Diffuser (Permit Application to S.C. Water Resources Commission - SCWRC)
14,338	IND. WASTEWATER	H-Z Inter-Area Salt Solution Transfer Line (H-Area - Z Area) (As-Built Permit to Transfer Solution From Tank-50 in H Area)
14624	IND. WASTEWATER	As Built Process Sewer Lines Between 200 H & F Areas to F/H ETF
84-2Z-209	MAIN. DREDGING	Maintenance Dredging in Raw Water Intake Canal on Savannah River - South Carolina Water Resources Commission (SCWRC)
84-2Z-209	MAINT. DREDGING	Maintenance Dredging in Raw Water Intake Canal (681-5G) On Savannah River - Corps of Engineers (COE)
LS-10-S	SAN. WASTE	Sanitary Sewer System, Naval Fuels Material Facility, 248-F
14,407	SAN. WASTEWATER	Increased Sanitary Wastewater Treatment Capcity, 607-15D (D Area)
10,131-P	SAN. WASTEWATER	Septic Tank and Drain Field for RTF Construction Engineers Office
10,132-P	SAN. WASTEWATER	Septic Tank and Drain Field for FPF Construction Engineers Office
9998	SAN. WASTEWATER	Septic Tank And Drain Field for F&H ETF
LS-227-S	SAN. WASTEWATER	705-C Sanitary Sewer
LS-228-S	SAN. WASTEWATER	717-K Sanitary Sewer
LS-239-S	SAN. WASTEWATER	ECF/CAS Security Upgrade Facilities, F-Area
LS-240-S	SAN. WASTEWATER	3/700 Area Security Upgrade, Building 720-2A
LS-256-S	SAN. WASTEWATER	Grinder Pump for F-Area EQ. Basin (Macerator) (607-18F)
14,321	SAN. WASTEWATER	Interim Sodium Hypochlorite Dis. for SREL Waterfowl Lab
14,322	SAN. WASTEWATER	Interim Sodium Hypochlorite Dis. for 607-18G
14,315	SAN. WASTEWATER	Interim Sodium Hypochlorite Dis. for 607-7F & 607-21F

ENVIRONMENTAL PERMITS (Contd)

Permit Number	Type	Title
14,314	SAN. WASTEWATER	Interim Sodium Hypochlorite Dis. for 607-7P & 607-23P
14,312	SAN. WASTEWATER	Interim Sodium Hypochlorite Dis. for 607-17K
14,316	SAN. WASTEWATER	Interim Sodium Hypochlorite Dis. for 607-7H & 607-21H
14,317	SAN. WASTEWATER	Interim Sodium Hypochlorite Dis. for 831-1S & 832-2S
14,324	SAN. WASTEWATER	Interim Sodium Hypochlorite Dis. for 607-40T
14,319	SAN. WASTEWATER	Interim Sodium Hypochlorite Dis. for 607-1B
14,323	SAN. WASTEWATER	Interim Sodium Hypochlorite Dis. for 607-17F (NF)
14,313	SAN. WASTEWATER	Interim Sodium Hypochlorite Dis. for 607-17L
14,311	SAN. WASTEWATER	Interim Sodium Hypochlorite Dis. for 607-7C
14,320	SAN. WASTEWATER	Interim Sodium Hypochlorite Dis. for 607-9A
14,318	SAN. WASTEWATER	Interim Sodium Hypochlorite Dis. for 607-15D
13,156	SAN. WASTEWATER	716-2A Sanitary Sewer
LS-168-W	SAN. WASTEWATER	A-Area Sanitary Sewer
13,157	SAN. WASTEWATER	Computer Repair Building Sanitary Sewer, 722-5A
13,430	SAN. WASTEWATER	Sanitary Sewage Treatment Facility, 607-21F
13,173	SAN. WASTEWATER	Sanitary Sludge Land Application, K Area and Par Pond Borrow Pits
12,695	SAN. WASTEWATER	Replacement Tritium Facility Sanitary Sewer
13,175	SAN. WASTEWATER	Flow Equalization Basin, Building 607-22A
LS-158-S	SAN. WASTEWATER	Sanitary Sewer, 3/700 Construction Facility
12,910	SAN. WASTEWATER	Sanitary Treatment Facility, H Area
LS-149-S	SAN. WASTEWATER	Sanitary Sewer, TNX-ETP
LS-52-S	SAN. WASTEWATER	Sanitary Sewer, 707-H
10,906	SAN. WASTEWATER	Sanitary Sewer, 341-M
10,530	SAN. WASTEWATER	TNX Sanitary Wastewater Treatment Plant, 607-4G
10,499	SAN. WASTEWATER	DWPF Sanitary Sewer System, 200S
LS-35-S	SAN. WASTEWATER	Sanitary Sewer Relocation, Bldg. 735-11A
10,314	SAN. WASTEWATER	DWPF Construction Site Sanitary Sewer System
LS-62-S	SAN. WASTEWATER	717-F Sanitary Sewer Relocation for DWPF
8928	SAN. WASTEWATER	FMF Sanitary Waste Treatment Plant
LS-53-S	SAN. WASTEWATER	Sanitary Sewer Line, Construction Office Building, M Area
11,847	SAN. WASTEWATER	Effluent Weir for Sanitary Treatment System, TNX
11,615	SAN. WASTEWATER	Sanitary Treatment Plant - U-Area
9838	SAN. WASTEWATER	DWPF Sanitary Waste Treatment Plant
9983	SAN. WASTEWATER	Sanitary Treatment Plant, 100-C Area
LS-3-S	SAN. WASTEWATER	Sanitary Sewer System, Office Bldg., 703-41A
LS-2-S	SAN. WASTEWATER	Sanitary Sewer Line, Tritium Facilities Support Bldg., 235-H
9694	SAN. WASTEWATER	Sanitary Sewer System, 773-41A, 773-42A
9326	SAN. WASTEWATER	Sanitary Wastewater Treatment Plant, F, H, P & G Areas

ENVIRONMENTAL PERMITS (Contd)

Permit Number	Type	Title
LS-275-S	SAN. WASTEWATER	Sanitary Sewer for Equipment Storage & Health Protection (HP) Facility, 221-25F (F-Area)
13,291	SAN. WASTEWATER	H-Area Septic Tank & Tile Field (Commercial Toilet Trailer)
12,076	SOLID WASTE	Sanitary Sludge Land Application, F&H Area Borrow Pits
GW-02-894	UNDERGD. STORAGE	Gasoline Station Building 715-2G & Gas TK Replacement, Plantwide (UST)
LS-98-S	SAN. WASTEWATER	Sanitary Sewer Addition, S Area
12,453	SAN. WASTEWATER	Bromide Feed System, 607-18F
12,452	SAN. WASTEWATER	Bromide Feed System, 607-19L
10,825	SAN. WASTEWATER	Sanitary Sewer Lift Station, 607-19-A
11,847	SAN. WASTEWATER	Effluent Weir, TNX
11,442	SAN. WASTEWATER	Lift Station - Force Main, 241-82H
LS-32-S	SAN. WASTEWATER	Sanitary Sewer Line, Wackenhut Bldg., TC/U Area
10,521	SAN. WASTEWATER	Chemical Feed Facility, A Area
10,522	SAN. WASTEWATER	Chemical Feed Facility, F Area
10,523	SAN. WASTEWATER	Chemical Feed Facility, H Area
10,524	SAN. WASTEWATER	Chemical Feed Facility, P Area
10,525	SAN. WASTEWATER	Chemical Feed Facility, G Area
10,526	SAN. WASTEWATER	Chemical Feed Facility, D Area
10,236	SAN. WASTEWATER	Lift Station, Change Station Facility, 241-58H
9940	SAN. WASTEWATER	Sanitary Sewer System, Reactor Simulator Facility, 707-C
8881	SAN. WASTEWATER	Flow Equalization Basin, 700-A
LS-78-S	SAN. WASTEWATER	Sanitary Sewer Line for Construction Office Building, C Area
LS-80-S	SAN. WASTEWATER	Sanitary Sewer Line - Receiving & Stores Warehouse Const. Central Shops
LS-79-S	SAN. WASTEWATER	Sanitary Sewer Line - Electrical Office Bldg., Const. Central Shops
11,407	SAN. WASTEWATER	Sanitary Waste Transfer Station 321-M Change Room Renovation
13,155	SAN. WASTEWATER	Naval Fuels Flow Measurement Device; Outfall F-003(A)
14,443	SAN. WASTEWATER	Septic Tank and Tile Field, H Area
LS-134-S	SAN. WASTEWATER	DWPF Sanitary Sewer Line Modification
9256P	SAN. WASTEWATER	Septic Tank and Tile Field, Landfill Monitoring Bldg. 642-G
12,725	SAN. WASTEWATER	F-Area STP-Phase III, 607-F
12,498	SAN. WASTEWATER	F-Area STP-Phase III
LS-206-S	SAN. WASTEWATER	Sewer Pipe and Manhole, 704-1T TNX
8611-P	SAN. WASTEWATER	Septic Tank and Tile Field, CS Area, 709-1G
13,717	SAN. WASTEWATER	Wastewater Treatment Facility, Z Area (Septic Tank System)
12,383	SAN. WASTEWATER	Fuel Production Facility Sanitary Sewer, 225-H
LS-129-S	SAN. WASTEWATER	Sanitary Sewer, 719-4A
12,386	SAN. WASTEWATER	Sanitary Sewer, 730-M

APPENDIX B

SAVANNAH RIVER SITE HISTORICAL ENVIRONMENTAL HIGHLIGHTS

1950 - Original Du Pont Contract Awarded in August

1951 - Began Onsite Environmental Monitoring

1951 - Started Forest Management

1951 - Began Biological Monitoring of the Savannah River by the Academy of Natural Sciences Of Philadelphia

1952 - Began The University Of Georgia Ecology Studies At SRS

1953 - Began Use of Environmental Technical Standards Based on Recommendations of Standards-Setting Organizations such as NCRP, ICRP, FRC, AED

1959 - Began Distribution of Annual Environmental Monitoring Report to the Public

1960 - Established Radionuclide Release Guides for Specific SRS Streams

1961 - Established University of Georgia-Operated Savannah River Ecology Laboratory

1964 - Related Release Guides to Potential Dose and Technical Standards Containing Release Guides for all SRS Streams Were Established to Stay Under the Dose Limit

1964 - Established Release Guides For I-131 from all SRS Stacks

1965 - Started Controlled Deer Hunts

1971 - Formed Environmental Analysis and Planning Division Which Reported Directly to Du Pont Management

1971 - Developed a Radioactivity Emission Inventory

1972 - Provided Radioactive Dose Calculations for Offsite Public from SRS Releases in Annual Environmental Monitoring Report for the First Time

1972 - Prepared a Report on SRS Thermal Distributionsin SRS Waters and in the Savannah River

1972 - Du Pont Site Technical Standards Took "As Low As Reasonably Achievable" Approach for Environmental Releases and this was Applied to Release Guides on an Annual Basis Thereafter

1972 - Du Pont Site Technical Standard Set for Offsite Dose to Maximum Individual Of 10 mrem/year to Whole Body, Gonads and Bone Marrow, 30 mrem/year to Gi Tract, Bone Thyroid and all other Organs

SAVANNAH RIVER SITE HISTORICAL ENVIRONMENTAL HIGHLIGHTS (Contd)

1972 - Developed an Applied Research Plan for SRL/SRS

1972 - Became The First National Environmental Research Park within DOE

1973 - Formed an Environmental Research Organization within SRL

1973 - Formed a Central Environmental Committee

1974 - Performed First Epidemological Studies of Populations Surrounding the Site

1974 - Began Improving Meteorological Input to Site Emergency Capabilities

1975 - Published a Report Outlining the Needs for Environmental Monitoring of Nonradioactive Materials

1975 - Began Studies on Tritiated Gas Cycling in Forest Ecosystems

1976 - Conducted Studies on Uptake of Plutonium by Agricultural Crops

1977 - Conducted Dye Studies onsite Creeks to Obtain Transport and Dispersion Parameters

1978 - Added Automated Forecast Meteorology to Site Emergency Response Capability through Collaboration with the National Weather Service

1979 - Developed an Understanding of The Ecology of the Legionnaires Disease Bacterium

1980 - Developed a Computer Model of Heavy Gas Dispersion

1983 - Formed a Du Pont Environmental Advisory Committee for the Site

1985 - Completed the TRAC Mobile Laboratory

1985 - Merged the On-And Offsite Environmental Monitoring Reports and included Highlights Of Site Wide Environmental Studies In the Annual Public Report

1985 - Completed the Ultra-Low-Level Underground Counting Laboratory

1986 - Standardized And Verified Methods of Calculating Dose to Public through Environmental Pathways

1986 - Published DOE Strategic Environmental Plan

1988 - Published a Draft DOE Environmental Implementation Plan

-END-

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