FACTS
ABOUT THE SAVANNAH RIVER SITE

December 2006

Waste Management

At the Savannah River Site (SRS), waste was generated as a result of the manufacturing of plutonium, tritium and other nuclear materials required to support our national defense. SRS manages liquid nuclear waste, low-level waste, hazardous waste, mixed waste, transuranic waste and sanitary (non-radioactive, non-hazardous) waste.

Liquid nuclear waste

After fuel and targets were fabricated, assembled and irradiated in nuclear reactors, the resulting spent fuel and targets were taken to separations plants. There, the desired products were chemically separated, leaving the unusable byproducts as intensely radioactive waste. This radioactive waste from the separations process was generated in both solid and liquid forms.

In storage tanks, the insoluble solids settle and accumulate on the bottom of the tanks. This is referred to as "sludge." Liquid above the sludge is concentrated by evaporation to reduce its volume. The concentration process produces a precipitated solid called "salt cake" and the remaining concentrated liquid is commonly referred to as supernate or "liquor".

All of the liquid radioactive waste produced at SRS to date is stored in tanks on site. Approximately 100 million gallons of high-level waste have been concentrated by evaporation to a present volume of about 36 million gallons.

SRS waste tanks have provided 50 years of safe storage for this nuclear waste. These tanks include four designs, all consisting of a steel tank within a concrete vault.

- Types I and II, the oldest tanks, have 5-foot high secondary steel containment pans within a concrete vault and forced cooling systems. Type I tanks are 75 feet in diameter and hold 750,000 gallons. Type II tanks are 85 feet in diameter and hold 1.03 million gallons. Some of these tanks have developed small hairline cracks that leaked salt solution into secondary pans below the tanks. The cracks were induced by high nitrate concentration in the waste solutions and residual stresses near weld sites.

- Tank 16, a Type II tank, is the only tank to have had a release of waste from the secondary pan. The leak, which occurred in 1960, was from the primary tank into the secondary pan and then through a concrete vault joint into the ground. The tank was removed from service and cleaned. Currently, Tank 16 is empty awaiting decommissioning and is included in the Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation program. The location where the waste contacted soil has been monitored to ensure that the surrounding soil retained the waste and that it has not migrated to other areas.

- Type III tanks have full-height secondary containment. These tanks, built since the mid-1960s, have been successfully stress-relieved to prevent stress cracking. Corrosion and pitting of the tanks are controlled through a special waste-chemistry program. Under this program, the waste is sampled and chemicals added, if necessary, to maintain corrosion inhibitors within prescribed limits.

- The Type III design holds 1.3 million gallons and is 33 feet high and 85 feet in diameter. The inner (primary) tank that actually holds the waste is shaped like a doughnut around the central concrete column that supports the roof. A secondary containment tank completely surrounds the primary. The secondary tank is surrounded by a 2- to 4-foot thick concrete vault. As a fourth independent containment for the waste, a minimum 10-foot layer of specially selected, impermeable clay is placed around the tank. No cracks or leak sites have occurred in any of the Type III tanks.

- Type IV tanks have a single wall and do not have a forced cooling water system. Type IV tanks are designed for waste storage that does not require auxiliary cooling. This tank type is basically a steel tank within a prestressed concrete vault in the form of a vertical cylinder with a domed roof. Each tank holds 1.3 million gallons and is 85 feet in diameter and 34 feet high.

Plans call for removing the waste from all of the tanks for processing in existing and new facilities.

- The sludge that remains in the waste tanks (which contains most of the radioactivity), along with the radioactive cesium from the salt solution, will be transferred to the site's Defense Waste Processing Facility for immobilization within borosilicate glass. The Defense Waste Processing Facility began radioactive operations on March 12, 1996. At the end of FY06 over 2200 canisters of sludge waste have been produced.

- The salt waste will be processed via the planned Salt Waste Processing Facility (SWPF) starting in 2011 to remove cesium, strontium, and actinides. The decontaminated salt solution will then be sent to the existing Saltstone Processing Facility where it will be mixed with cement-like materials to produce a solid "saltstone" low level waste form. The highly radioactive cesium, strontium, and actinides will be sent to the DWPF for mixing with the sludge and vitrified. Prior to SWPF startup in 2011, a limited quantity of salt waste will be processed via modified and new small scale facilities to remove some of the radioactivity prior to disposal of the salt waste. This interim processing is being undertaken starting in 2007 to ensure adequate tank space is maintained to continue operation of DWPF and to provide feed tanks for the large scale SWPF when it starts up in 2011.

Liquid low-level waste

Liquid low-level waste is a by-product of the separations process and tank farm operations. This waste is treated in the Effluent Treatment Project (ETP). This facility treats the liquid waste for discharge to a National Pollutant Discharge Elimination System permitted outfall, effectively capturing all chemical and radioactive contaminants except tritium. The state-of-the-art process includes: pH adjustment, submicron filtration, organic removal, reverse osmosis and ion exchange. ETP replaced the seepage basins that were used until November 1988.

Sanitary Waste

Sanitary Waste or municipal solid waste is solid waste that is neither radioactive nor hazardous as defined by the AEA or RCRA. Sanitary Waste consists of materials that would be received by a municipal sanitary landfill (office waste, food, garbage, refuse and other solid wastes that are similar to those generated by most households) and industrial waste (construction debris, scrap metals, wood waste, etc).

Solid low-level waste

The site's solid low-level wastes (LLW) include such items as contaminated protective clothing, tools and equipment that have become contaminated with small amounts of radioactive material. Solid LLW is first sorted, segregated (separated by type and amount of radioactivity), and in some cases volume reduced. It is then packaged and disposed of according to its nature and characterization. Most LLW is safely treated and disposed of onsite using four different options: the Low Activity Waste Vaults (LAWV), the Intermediate Level Vaults (ILV), Engineered Trenches or the Slit Trenches. Radionuclides that require greater isolation from the environment are generally disposed of in vaults while other radionuclides that do not require greater isolation can be disposed of in trenches.

The vaults are constructed of special formulated concrete that provides greater isolation from the environment than trench disposal. Radionuclides that are more mobile in the environment, such as tritium, are primarily disposed of in these vaults. The vaults are also equipped with liquid collection sumps that are monitored periodically for environmental compliance.

The Engineered Trenches are used for LLW that are containerized in steel boxes or Sealand containers. The Engineered Trenches are equipped with a sump to capture and monitor the runoff from rainwater to ensure environmental compliance. The Slit Trenches are primarily used for un-containerized LLW received from the demolition of facilities around SRS. Another type of Slit Trench, where contaminated large equipment is disposed of in "vault type disposal", is known as "Components-in-Grout."

The technique, called "Components-in-Grout," consists of placing the item on a one-foot thick grout base, filling any void space with special formulation grout, and grouting around the item using the trench walls as a form. This technique allows for the disposal of large equipment that is classified as low-level waste, without having to build new vaults.

Both the Engineered and Slit Trenches are equipped with vadose monitoring systems. These systems provide an "early warning" system for radionuclides migrating through the soil so that DOE can take the appropriate actions and ensure environmental compliance.

SRS waste management facilities are not suitable for treatment and disposal of all types of low level waste; therefore, commercial vendors and other DOE facility capabilities, such as the Nevada Test Site, are being utilized to properly manage the current waste inventory. All offsite shipments are reviewed and approved by SRS Department of Transportation (DOT) trained personnel to ensure compliance with DOT Regulations.

TRU waste
Waste that contains transuranic (TRU) nuclides (radioactive elements with an atomic number greater than uranium [92]) is prepared for shipment and stored at SRS while awaiting shipment to the Department of Energy Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico. The initial shipment of waste from SRS was shipped May 8, 2001, and shipments continue.

Hazardous waste and mixed waste
Hazardous wastes and mixed (containing both hazardous and radioactive components) wastes are stored on site in RCRA-permitted facilities until shipped offsite for treatment and disposal.

Waste minimization program
SRS has an active waste minimization program to reduce volume and/or avoid production of all waste types generated at the site. Efforts to reduce or eliminate waste before it is generated include process modification, use of alternative process material, recycling and reuse. Efforts to reduce waste after it has been generated include segregation of non-radioactive and non-toxic materials and waste compaction.