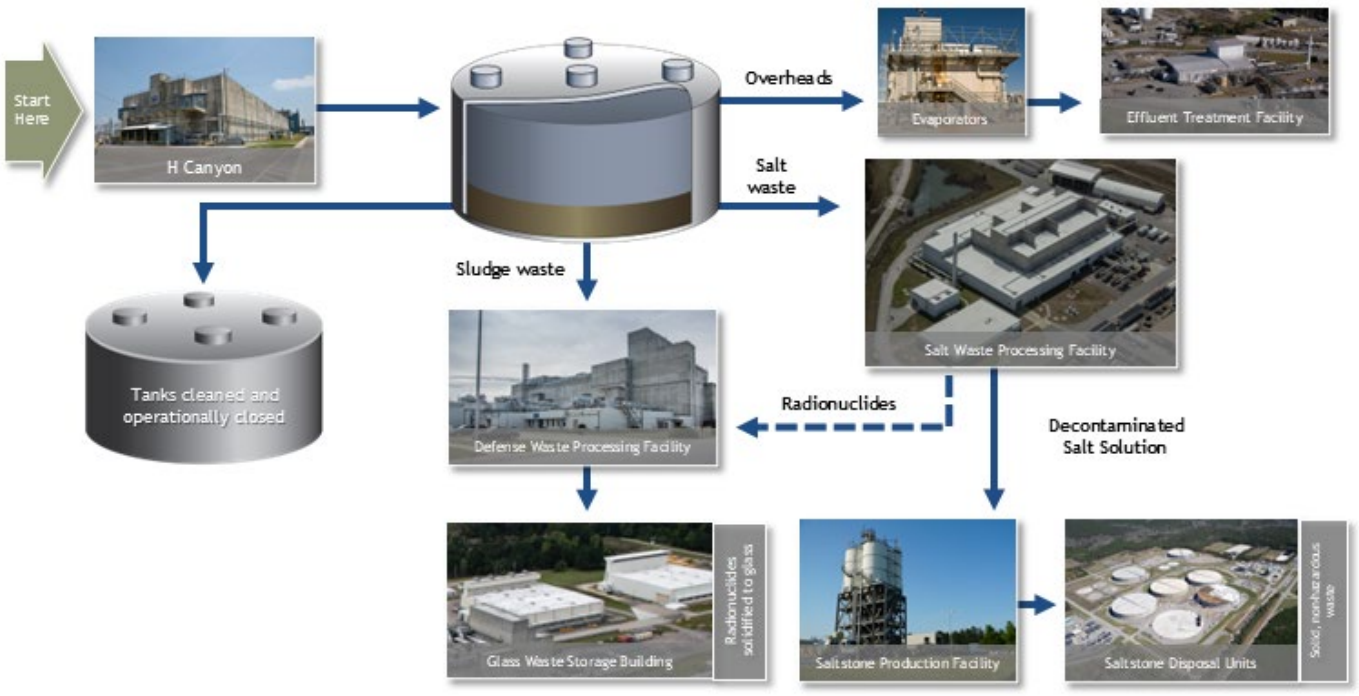
Facts from the Savannah River Site
ENVIRONMENTAL STEWARDSHIP • NATIONAL SECURITY • SCIENCE AND ENERGY

Liquid Waste Facilities

Radioactive liquid waste is generated at the Savannah River Site (SRS) as by-products from the processing of nuclear materials for national defense, research, medical programs, and outer space missions. The waste, totaling about 32 million gallons, is stored in the remaining 43 underground carbon-steel waste tanks grouped into two tank farms at SRS.

The liquid waste program at SRS consists of high-hazard operations, which include complex engineering, procurement, construction, waste treatment, grouting, and disposal in order to operationally close the radioactive liquid waste tanks. Below is a diagram of the process.

SRS Liquid Waste Cycle



TANK FARMS

SRS has a total of 51 waste tanks built in the Site's F and H Areas; eight of those tanks have been operationally closed. Several of the remaining 43 waste tanks are in various stages of the waste removal, cleaning, and operational closure process. In waste tanks, the insoluble solids in the waste settle to the bottom, forming "sludge." Liquid above the sludge, referred to as salt waste, is concentrated by evaporation to reduce its volume. As the concentrated salt waste cools, a portion crystallizes forming a solid "saltcake." This concentration process not only reduces the volume, but also makes the waste less mobile.

EVAPORATORS

Since the processing of nuclear materials began, more than 160 million gallons of radioactive liquid waste has been received for storage into the tank farms, exceeding the maximum 59-million-gallon capacity of the 51 underground waste storage tanks.

The salt waste has been reduced to about 25 to 30 percent of its original volume by a controlled evaporation process in five site liquid waste operations evaporators – three of which have since ceased operations. The condensed evaporator "overheads," or water removed from the waste, are transferred to the Effluent Treatment Facility for final treatment prior to release to the environment.

EFFLUENT TREATMENT FACILITY

The Effluent Treatment Facility treats the low-level radioactive wastewater, which was formerly sent to seepage basins, in accordance with the state of South Carolina regulatory permit. Treated streams include evaporator overheads, segregated cooling water, contaminated surface water runoff, transfer line catch-tank streams, and others.

- Began operating in 1988.
- Processes approximately 10 million gallons of wastewater per year.
- Treatment processes include pH adjustment, filtration, organic removal, reverse osmosis, and ion exchange.
- Treated wastewater streams are released to a permitted outfall.

The Effluent Treatment Facility treats low-level radioactive wastewater.

SALT WASTE PROCESSING FACILITY (SWPF)

Removing salt waste, which makes up approximately 92 percent of the waste volume in the SRS tank farms, is a major step toward emptying and closing the Site's remaining 43 high-level waste tanks that contain approximately 32 million gallons of waste. SWPF has been processing radioactive waste since October 2020. The facility is expected to treat most of the salt waste stored in the waste tanks at a rate of approximately six to nine million gallons each year.

SWPF is processing the majority of the Site's salt solution waste.

The SWPF separates and concentrates the highly radioactive waste-mostly cesium, strontium, actinides, and waste slurry from the less radioactive salt solution. The process begins by transferring the waste from H Tank Farm to SWPF where it undergoes a two-step cleanup process. The first step removes strontium and actinides (uranium, plutonium, etc.) from the waste. The second step, known as Caustic Side Solvent Extraction (CSSX), is designed for the removal of radioactive cesium.

After the separation process is completed, the concentrated high--activity waste stream from SWPF is sent to the nearby Defense Waste Processing Facility (DWPF) to be combined with sludge waste and immobilized in glass. The decontaminated salt solution (DSS) from SWPF is sent to the nearby Saltstone Production Facility (SPF) to be mixed with grout and permanently disposed in Saltstone Disposal Units (SDU).

SALTSTONE PRODUCTION FACILITY (SPF)

The SPF contains the tanks and equipment necessary to receive the DSS and process it into saltstone grout by mixing the liquid feed with dry materials (fly ash and slag). The grout is pumped from the SPF to the Saltstone Disposal Facility, which contains numerous Saltstone Disposal Units (SDU), where the saltstone grout solidifies into a monolithic, non-hazardous, solid low-level waste form.

DEFENSE WASTE PROCESSING FACILITY (DWPF)

DWPF is the radioactive waste glassification plant at the

DWPF began radioactive operations in March 1996.

Savannah River Site. This facility, which began radioactive operations in March 1996, uses a vitrification process to convert high-level radioactive liquid waste currently stored at SRS into a solid glass form suitable for long-term storage and disposal. Scientists have long considered vitrification as the preferred option for treating radioactive liquid waste.

DWPF is vitrifying sludge from the radioactive liquid waste stored in waste tanks, along with actinides, cesium, and strontium removed from the salt forms in the waste. In this vitrification process, a sand-like borosilicate glass (called "frit") is mixed with the waste and sent to the plant's 75-ton steel and ceramic melter. In the melter, electricity is used to heat the waste/frit mixture to nearly 2,100 degrees Fahrenheit until molten. This molten glass-waste mixture is poured into stainless steel canisters to cool and harden.

After filling the canister, the exterior is blasted with a frit-water mixture to remove any surface contamination and a stainless-steel plug is fitted into the neck of each filled canister then welded into place. The canisters containing vitrified high-activity waste produced at DWPF are currently stored onsite in one of two Glass Waste Storage Buildings.

By immobilizing the radioactivity in glass, DWPF reduces the risks associated with the continued storage of liquid waste at SRS and prepares the waste for final disposal in a federal repository.

AN INTEGRATED SYSTEM

The liquid waste processing facilities at SRS work together as a highly integrated system to safely manage and treat radioactive liquid waste generated from decades of nuclear weapons production and research. Whether it's immobilizing the highly radioactive sludge into glass or the liquid salt waste into concrete, these interconnected facilities work together to reduce risks to workers, the public, and the environment, while enabling the ongoing cleanup of legacy materials at SRS.