H Tank Farm Tour

Tour Script

Enter H Tank Farm through "L" Gate on Road E. Park the bus across the street from "L" Gate, unload and walk across to "L" Gate. Escorts provide the accountability listing of personnel on the tour to the FR.

<u>Entrance and Safety Issues</u> – Cautions noted below will be read to visitors at "L" Gate

Note: All tour participants must remain with the group.

During the tour, please watch your step, as there are potential tripping hazards such as uneven pavement, rocks, hoses, and extension cords that may be in our walking path. In the event of an alarm or evacuation announcement, please follow your tour guide to the designated rally point. All escorts please raise your hands – follow one of these individuals. Our tour will take us to a vantage point overlooking the Effluent Treatment Project (ETP), also known as Effluent Treatment Facility (ETF), we will walk on roadways near Waste Tanks 49 and 51, the Modular Caustic Side Solvent Extraction Unit (MCU), and the Actinide Removal Process (ARP), we will then proceed along the roadway to the 242-16H (2H) Evaporator and then to another vantage point overlooking the remainder of H Tank Farm where you will be able to see several facilities including 242-25H (3H) Evaporator, Type I, II, and IV waste tanks, and the newest HTF Diversion Box HDB-8.

Note to TOUR GUIDE --- Proceed through the gate and walk along the roadway leading up to H Tank Farm – East Hill. Stop near the top of the hill and direct attention to the right and the Effluent Treatment Project.

Effluent Treatment Project (ETP)

The Effluent Treatment Project (ETP) was designed and built to collect and treat process low level radioactive and chemically contaminated wastewater. Primary sources of wastewater include F & H Canyon Facilities, F-Area Laboratories, and F & H Tank Farm evaporator overheads. The ETP facility has been in operation since October 1988. The ETP facility typically discharges 6 – 10 million gallons of treated water annually. Operators in ETP maintain a Level "A" or Level "D" state certification as a physical / chemical treatment plant operator issued by the State of South Carolina. The ETP process is primarily located in building 241-81H with various other structures located in the vicinity of 241-81H. The ETP process also includes the following process locations which are managed by the ETP organization;

- F-Area Retention Basin
- F-Area Cooling Water Basin
- H-Area Retention Basin
- H-Area Cooling Water Basin
- Lift Stations, Force Main Valve Pit
- Piping systems leading from both F and H Areas to the ETP

Waste generators comply with their individual Waste Compliance Plans (WCP) when sending their waste streams to ETP to ensure collectively that ETP stays within its approved Waste Acceptance Criteria (WAC). The WAC/WCP process ensures ETP stays within its processing capability and does not exceed its allowed radiolytic inventory.

ETP - Building 241-81H (Point out the three sections of the building as housing the control room, process, and evaporators)

This section of the plant contains the Control Room, break room, Shift Managers' office and change rooms. The ETP process is computer controlled via the control room computer console. The control room is manned 24 hours / day, 7 days / week.

The ETP process is as follows;

Wastewater collection - The ETP process includes receipt of wastewater into two 485,000 gallon collection tanks. (Located on the far side of ETP)

pH adjustment - From these tanks the wastewater is pumped inside 241-81H for pH adjustment.

Filtration - Solids are precipitated out and removed during filtration in the next step of the process. Filtration is via a 3 stage ceramic Norton filter system. At various points throughout the process, waste streams are diverted from the process and sent to the ETP evaporators for volume reduction and the resulting bottoms are transferred to H Tank Farm - Tank 50 for storage. Evaporator overheads are returned to the ETP process.

Organic Removal - From the Norton filters the wastewater is sent to the Organic Removal system. Organic Removal includes Mercury removal columns (these columns are outside, next to the wastewater collection tanks) and activated carbon beds to remove organic contaminates and heavy metals. These columns are periodically replaced.

Reverse Osmosis - The wastewater is then processed through the Reverse Osmosis system to remove dissolved solids.

Ion Exchange - RO is followed by Ion Exchange to remove heavy metals, cesium, and strontium.

Treated Water - The resulting treated water is stored in one of three 155,000 gallon treated water storage tanks. (The three treated water storage tanks are visible to the right side of ETP). Treated water is sampled for permit compliance and released from these tanks to Upper Three Runs Creek.

We will continue to walk along the roadway to a point midway between Tanks 49 and 51 on your left.

Tank 48

Tank 48 is a Type IIIA Waste Tank. The primary tank is made of annealed carbon steel and is 85 feet in diameter and 33 feet in height with a maximum operating capacity of 1.3 million gallons. Tank 48 was previously part of a process called In-Tank Precipitation (ITP) process. It contains large quantities of cesium (Cs)/potassium tetraphenylborate as a result of the ITP process. Tank 48 has a unique feature and that is the ability to blanket the waste tank head space with Nitrogen (point to Nitrogen storage tanks to the left of

MCU). This is primarily used during mixing operations and is due to the presence of Benzene and its flammability concerns. It is the only Tank in both of the tank farms that requires this safety control.

Tank 49

Tank 49 is a Type IIIA Waste Tank. Tank 49 like Tank 48 was utilized for ITP and has the same ability to blanket the tank with Nitrogen. De-inventorying Tank 49 has allowed these controls to no longer be required. Tank 49 is now utilized as the waste tank selected to provide feed to the Actinide Removal Process (which will be discussed later). This Tank will receive feed from the F-Area Tank Farm.

Tank 50

Tank 50 is a Type IIIA Waste Tank. Tank 50 is currently utilized to receive low level waste from the 221-H Canyon Facility and the Effluent Treatment Plant (ETP). When the MCU Facility becomes operational, the Decontaminated Salt Solution will be transferred into Tank 50. In addition, Tank 50 is used to store low level waste to support waste transfers into the Saltstone Facility (you will tour the Saltstone facility later today).

Tank 51

Tank 51 is a Type IIIA Waste Tank. Tank 51 is currently used to process and store waste for new sludge batches destined for the DWPF. Tank 51 is currently storing Sludge Batch 4.

Now direct your attention to the building on the far side of Tanks 48-50, this is 241-96H and currently houses the Actinide Removal Process.

<u>241-96H Actinide Removal Process (ARP) Facility</u>

Building 241-96H was initially constructed to house the In-Tank Precipitation (ITP) process for disposition of salt waste containing cesium, strontium, and actinides. Due to Benzene and associated flammability issues, the ITP process and building was de-inventoried and abandoned in place in December 1997.

In 2004, 241-96H was re-configured as part of the new salt processing initiative to contain a portion of the Actinide Removal Process; the remainder being located in building 512-S, which is located to the East (point towards 512-S).

The South end of building 241-96H was modified to contain two 6,450 gallon tanks placed in existing cells. The tanks will be used to provide capacity for combining salt waste with monosodium titanate (MST). MST is used in this process because of its high selectivity for strontium and actinides via adsorption.

Salt waste is staged in Tank 49 in preparation for transfer to 241-96H. Via batch processing, approximately 3,300 gallons of waste will be transferred into the MST strike tanks in 241-96H where it will be combined with process water and MST. The tank contents are then agitated for approximately 24 hours while temperature is controlled. The batch MST strike salt solution is then transferred to building 512-S for further processing. 241-96H system components include process water supply, MST addition station, chilled water system, process vessel ventilation system, and the MST strike tanks.

Once operational, the 241-96H ARP process will be "computer" controlled from the 241-2H Control Room. The 241-96H facility is currently near the end of startup testing and is expected to begin operations along with 512-S and MCU in late 2007.

Now direct your attention to the right and at the base of the rock bank you will see our newest facility, the Modular Caustic Side Solvent Extraction Unit facility.

<u>241-278H Modular Caustic Side Solvent Extraction Unit Facility</u>

The MCU (point to Building 241-278H) was designed and constructed to:

- Receive batches of high cesium (Cs-137)/low actinide clarified salt solution (CSS) from the Actinide Removal Process (ARP) located in the 96H and 512S Buildings
- Process the salt solution to remove/reduce Cs-137 using Caustic Side Solvent Extraction (CSSX) technology,
- Transfer batches of the low Cs-137/low actinide decontaminated salt solution (DSS) to Tank 50 for feed to the Saltstone Production Facility (SPF), and
- Transfer batches of the strip effluent (SE) solution of cesium nitrate from the CSSX process to the Defense Waste Processing Facility (DWPF).

The CSSX technology utilizes multi-component organic solvent and centrifugal contactors located in the taller section of the MCU building (point to the tall section of

MCU) to extract Cs-137 from salt waste. Coalescers and decanters located in the lower section of the MCU building (point to the lower area and the cell covers of MCU) process the decontaminated salt solution and strip effluent solutions to allow recovery and reuse of the organic solvent, and to limit the quantity of solvent transferred to the downstream facilities. This lower section utilizes cell covers for access to these process areas.

The MCU is designed to treat approximately one million gallons/year of high-level radioactive waste (HLW).

The MCU receives salt solution filtrate from the 512-S Facility. The filtrate containing cesium is transferred to MCU as a clarified salt solution (CSS). The CSS will be transferred to one of the two salt receiving tanks. One of the tanks is placed in the receiving mode while the second tank is in the processing mode. From the receiving tank, the clarified salt solution is transferred into the process feed tank. From the process feed tank the clarified salt solution is transferred to the first set of 7 centrifugal contactors called the Extraction Contactor Bank.

In the extraction bank, the clarified salt solution is mixed with the solvent material to extract the cesium (Cs-137) component from the salt. The clarified salt solution minus the cesium component will be transferred to Tank 50 for later disposal in the Saltstone Facility.

The solvent/cesium mixture will be processed in three different sets of contactors which will scrub (Scrub Contactors) traces of salt coming from the extraction process, will strip (Strip Contactors) the cesium from the solvent and will wash (Wash Contactors) the solvent which allows the solvent to be re-used in the process. The strip effluent (Cesium

137) solution will be transferred to the Defense Waste Processing Facility (DWPF) for Vitrification.

We will now continue along the roadway, passing the 241-82H Control Room on your right and Waste Tanks 49 and 48 on your left. Proceeding north we are now facing the 242-16H Evaporator.

242-16H Evaporator

The large structure you see in front of you (point to the evaporator) is the 242-16H evaporator, which will be referred to as the 2H evaporator for the remainder of this discussion. The 2H Evaporator is centrally located among six (6) Type IIIA waste tanks. The primary function of the 2H evaporator is to recover tank space through evaporation, which includes Defense Waste Processing Facility (DWPF) recycle water transfers. The boiling action in the evaporator causes the liquid to separate from the waste. The separation of the liquid from the waste reduces the volume to approximately 25%-30% of its original volume. To obtain this waste volume reduction, it usually takes processing the waste three to four cycles through the evaporator. The 2H Evaporator requires scheduled and some unscheduled maintenance activities throughout the year. These activities can be minor in nature such as inspecting the evaporator pot, minor steam leak repairs or instrumentation calibration or replacement. The 2H Evaporator was placed in service in 1985. The evaporator pot was replaced and in service since approximately 1995. The life expectancy of an evaporator pot is approximately 10 years. Improvements

in materials of construction and methods of chemistry control during idle periods make the life expectancy conservative. Procurement actions are underway to obtain a replacement pot. Periodic acid cleanings are required for the 2H to remove scale deposits resulting from processing the DWPF recycle water which contains silica. These acid cleanings are examples of a major maintenance outage.

The basic operation of the evaporator system is to receive waste from the feed tank, currently Tank 43 (point in the direction of Tank 43). The waste is transferred through an underground transfer line into the evaporator pot by a feed pump. The waste in the evaporator is boiled using 150 pound steam and is separated into vapor and concentrated liquid. The boiled off liquid contents, referred to as overheads, is then transferred to the Effluent Treatment Project for final processing and eventual permitted release to the environment. The concentrated liquid is transferred out of the evaporator pot and drains to a concentrate receipt tank, currently Tank 38 (point indirection of Tank 38). As the concentrate receipt tank reaches its fill limit, the waste is transferred back to the feed tank, Tank 43, and the process is repeated. This is how the 25-30% waste reduction is obtained.

We will now continue generally towards the West past Waste Tank 42 on your right and the 241-28H Control Room on your left. Stop at the top of the rock bank, and look West towards the H Tank Farm – West Hill.

Scanning the facilities in front of you, you see the Type I and Type II waste tanks in the foreground, HDB-8 Diversion Box facility is beyond the Type II tanks and to the left, and 242-25H Evaporator is in the distance and to the right.

Type II Waste Tanks

There are four Type II waste tanks at SRS, all located in H Tank Farm. These are tank numbers 13 through 16 and were built in 1955 and 1956 (point in direction of the Type II tanks in the foreground). Type II tanks have a capacity of 1,030,000 gallons and are 85 feet in diameter and 27 feet high. Each tank has a 5' high and 90' diameter secondary containment creating an annulus space between the main tank and the secondary containment. Each of these Type II tanks is inactive and has known leak sites with the waste level being maintained below the leak sites. Tank 16 has been completely emptied of waste; however, the annulus space has waste residues remaining from previous leaks.

Type IV Waste Tanks

The four Type IV tanks in H Tank Farms are located on the West Hill (point to the Type IV tanks). These are of the same design and construction as the Type IV tanks in F Tank Farm. Similar to the 1F Evaporator, the 1H Evaporator is located in the center of the Type IV tanks and has been removed from service. Closure plans still need to be developed and approved for this evaporator.

HDB-8 Diversion Box – (point to the facility)

Diversion boxes are used to receive and direct waste to differing waste tanks based on the positioning of pipe jumpers and valves within the diversion box. HDB-8 is the newest diversion box in the tank farms and is the only fully enclosed diversion box with both cell and building ventilation systems. HDB-8 houses 4 pump tank sections in addition to the diversion box section. The pump tanks are used to receive waste and send it to locations at higher elevations. HDB-8 can receive low level waste from DWPF as well as waste from F Tank Farm and H Tank Farm. Additionally, there is extensive piping under ground between and within the F and H Tank Farms. The underground piping facilitates transfers between the tank farms and between tanks. The piping is placed under ground to provide shielding to protect workers and to protect the transfer system.

242-25H Evaporator – (point to the evaporator)

242-25H Evaporator commonly referred to as 3H Evaporator, is the newest and largest evaporator in operation at SRS. 3H Evaporator was placed in service in December 1999 and has an evaporator pot volume of 19,000 gallons; for comparison, 2H and 2F evaporator pot volume is 3,600 gallons. The 3H Evaporator system receives waste from Tank 32 and has the capability to drop concentrated waste to either Tank 30 or Tank 37. Waste processed in 3H Evaporator is primarily received from H Canyon or F Tank Farm. DWPF process recycle water is currently not processed in the 3H Evaporator. Operational control for 3H Evaporator is through a “computer controlled” system. 3H Evaporator uses 325 lb. steam to evaporate the waste, for comparison, 2H and 2F evaporators use 150 lb. steam. 3H Evaporator process is totally enclosed with separate building and process cell ventilation systems. Enclosure of the evaporator permits

maintenance operations to be performed without regard to wind and other limiting weather conditions. Process enclosure also permits better control over the spread of contamination. The evaporator has an adjacent service building which contains the overheads tanks, steam reducing stations, downstream tube bundle flash tank and condensate tank, building ventilation HEPA filter banks, gang valve assemblies, and flush water supply pumps.

3H Evaporator has produced an average 1,000,000 gallons / year of overheads for the past 4 years. Although the evaporator has the capability to produce much greater volumes of overheads, lack of feed has been the key limiting factor in maintaining this production level.

(Point out) H Canyon Facility and Tritium Facilities – These facilities are not part of the Liquid Waste System and outside this acquisition scope of work.

This concludes our tour of H Tank Farm. We will walk back out of the tank farm the same way we came in. Caution: Do not walk down the stairs at the rock bank.