WSRC-TR-94-100-01

682362

Savannah River Technology Center

Monthly Report

January 1994

Westinghouse Savannah River Company
Savannah River Site
Aiken, SC 29808

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Executive Summary

Tritium

- The gas manifold used for single bed loading test in Building 774-A was modified to permit high temperature/high pressure D_2 desorption isotherm tests of the full size $LaNi_{4.89}Al_{0.11}$ bed at a wide range of H/M ratios. (page 7)

- Initial stem drilling tests on internally pressurized stems using the newly fabricated sealed, windowed fixture began in the cold deuterium development facilities. Valuable data on a similar tube drill/weld process was obtained from Pantex. A new preferred Replacement Tritium Facility (RTF) location for a reclamation facility was specified and documented. (page 7)

- An inappropriate decontamination solution containing a household bleach was used on protective caps for reservoirs in the Tritium Facility between June 1993 and December 1993. Savannah River Technology Center (SRTC) has determined that corrosion will not occur on any of the reservoirs that came in contact with the caps. (page 8)

- Plastic caps are used on reservoirs to protect the integrity of fill stems. Tritium Operations in Building 234-H decontaminates and recycles these plastic caps. A concern was raised that the caps may retain some chlorine from the cleaning solution that could leach out to the reservoir where contact is made between the reservoir and the cap. Results from the Materials Testing Facility analyses establish that the amounts of chlorine detected were negligible. (page 8)

- The minimum number of calibration points needed for an in-bed accountability bed calibration was investigated. It was determined that fewer calibrations will be needed than previously required, which will reduce the time and cost of calibrating the hydride beds in the RTF. (page 8)

- Revisions to the conceptual design for nonnuclear consolidation at Savannah River Site (SRS) are being investigated because of budgetary constraints. Department of Energy-Savannah River (DOE-SR) has requested a revised "high spot" estimate for the Nonnuclear Consolidation mission at SRS be provided to them by January 21, 1994. SRTC is supporting the cost reduction effort by assisting in revisions to the existing design and scope. Details of some proposed changes are provided. (page 9)

Separations

- The F-Canyon Safety Analysis Report Addendum was approved by DOE-SR on December 10, 1993. The addendum is one part of the upgraded safety documentation required for restart of F Canyon. (page 11)

- Savannah River Technology Center (SRTC) demonstrations of H-Canyon processes are complete. This program developed operational models as training aids for Canyon personnel. The operation of the models was videotaped to train Separations personnel. Four processes were simulated: fuel-rod dissolution, solvent extraction, batch evaporation, and ion exchange. (page 11)

- In April 1993, a radionuclide separation facility in Tomsk, Russia, experienced an explosion in a processing tank that severely damaged the facility. Work is going on at several DOE sites to model the chemistry and understand the conditions that led to the explosion. (page 11)

- Experimental work at SRTC has shown that the nitric acid added to the tank at Tomsk could have concentrated in a relatively thin strata below a floating organic layer. Concentrated nitric acid in direct contact with the organic layer would contribute to rapid oxidation of the organic material and subsequent tank overpressurization. (page 11)

Environmental

- A program has been initiated with the University of Georgia's Center for Applied Isotope Studies to determine the beginning of tritium releases from the Solid Waste Disposal Facility (SWDF). Cores and cross sections were taken from trees in the drainage area along the tributary of Four Mile Branch that has its origin in the SWDF. (page 13)

- Preliminary results of the Sanitary Landfill bioremediation treatability study show methane-stimulated microbes are capable of degrading concentrations of trichloroethylene over 100,000 ppb to less that 100 ppb in 14 days. (page 13)

- A poster session was presented at the Migration '93 Conference. The poster session illustrated work done to establish the radionuclide content of vegetation growing on the SRL Seepage Basins. The results have been combined into a database used to evaluate similar situations at SRS. (page 13)

- Phase I planting for the Pen Branch reforestation program has been completed. Monitoring plots are in place and a natural regeneration survey of the delta and its tail are currently underway. This will assist in determining the extent of credit that can be claimed for natural restoration against the goal. (page 13)

- An instream flow study was conducted to identify the minimum discharge from Par Pond that will support a balanced biological fish community in Lower Three Runs. Hydraulic data were combined with the AVDEPTH habitat to develop relationships between discharge and available habitat. (page 14)

- A hydrologic analysis of Steel Creek and a water balance study of L Lake were performed. The water balance of L Lake was studied to evaluate the effects of flow reduction on the Steel Creek hydrologic system. (page 14)

- Geotechnical characterization of the H-Area Tank Farm in 1992 indicated the possibility of soil liquefication and/or settlement during a seismic event that might cause differential tank settling. Sufficiently large differential settlement could cause tank structural failure followed by a liquid reactive waste release. The Environmental Sciences Section (ESS) of SRTC is supporting the overall program by evaluating the exposure consequence of liquid waste release at the ground surface and below grade. (page 14)

- Personnel from the Biotechnology Group of ESS performed work on a resin wash for TNX/Interim Waste Technology (IWT). Microbial analysis indicated there was no effect on the aerobic viable bacteria by the wash. (page 14)

- A dose assessment was completed that evaluated the risk from plutonium released to the atmosphere from F Area on December 27, 1993. The dose at the site boundary was 0.0021 mrem, which is equivalent to the natural background dose received in three minutes. (page 14)

- A literature search has begun for work on cost-benefits analysis in radiation protection. A review is also taking place on the decision-making tools available to risk managers in the Superfund remediation arena. (page 15)

- Environmental Restoration and other departments have expressed a need for semivolatile organic analysis (SVOA) capabilities at ADS. Laboratory space was designed and built for SVOA capabilities, and the equipment is being ordered in preparation for the start of this laboratory. (page 15)

- The scope of work for cone penetrometer services was completed and submitted into the procurement system. A conceptual model of the Magnetic Separation (Mag-Sep) system was developed and reviewed with the Environmental Protection Department. A meeting with South Carolina Department of Health and Environmental Control (SCDHEC) was scheduled for December 26, 1993. (page 15)

- The heating stage of the six-phase ohmic heating demonstration was successfully completed. Continuous heating was concluded on November 30, 1993, after approximately three and one-half weeks of power output to the electrodes. The heating resulted in a total of nearly 14,000 gallons of steam condensate

recovery. Initial analysis of the change in air flow from the extraction well and the changes in the piezometer readings measured both within and outside the heated pattern indicate a significant change in the permeability of the clayey sediments. (page 15)

- An overview report on the characterization and monitoring technologies that were developed as part of the Integrated Demonstration was completed on December 30, 1993. (page 15)

- An interim technology evaluation report on offgas treatment technologies was completed on December 31, 1993. The interim report discusses the nine technologies for which testing has been completed as of November 30, 1993. (page 16)

- The scope of work on an interagency agreement between the United States Geological Survey (USGS) and DOE was developed and delivered to the DOE Headquarters program manager. The scope outlines the roles and responsibilities for geophysical characterization work that will be performed in the A/M Area to help detect and delineate dense nonaqueous phase liquid (DNPL) contaminants in the sub surface. A meeting was held with faculty from Clemson University to outline the goals of research to detect and remove DNAPLs in the subsurface. The work will consist of the following; development of gas flow and transport analytical models during vapor extraction, development of numerical models of alcohol and surfactant flooding, laboratory studies of alcohol and surfactant flooding and subsequent development of engineering parameters for scale-up, and lab experiments to determine pressure-saturation curves for A/M Area soils. (page 16)

- Construction on the gas phase bioreactor system has begun and is on schedule. The system should arrive onsite for start up the last week of February. (page 17)

- The final corrective actions for the 1993 Continuing Corrective Action Report (CCAR) were completed this month. The two-meter temperature probe at the WJBF-TV tower monitoring facility was relocated to a position that is less influenced by solar heating of nearby buildings. New procedures were developed for calibration of the Environmental Technology Section (ETS) wind tunnel, the verification of anemometer cup assembly performance, and the verification of the transfer of backup data logger data to the final annual or five-year database. (page 17)

- The Savannah River Technology Center is one of the three organizations in the United States participating in the realtime modeling portion of the European Tracer Experiment (ETEX). The second dry run for realtime modelers was conducted on December 3, 1993. To ensure completion of a forecast within the allotted time, parallel RAMS analyses were initiated on the SRS Cray and an ETG IBM RISC workstation. The three-dimensional wind fields from this forecast were then used in the particle model to predict the dispersion of the plume. (page 17)

- Air quality modeling work carried out in December was focused on providing support for work on the SRS contribution to the environmental impact statement (EIS) for the spent nuclear fuel project. Databases containing AEI data were used to identify pollutants currently emitted from specified stacks in F and H Areas. Six new databases were set up to access over 200 files of pollutant data and these files were subjected to quality assurance parameters as they were loaded. Source records were assigned new source identifiers and model input files for six criteria pollutants and 23 toxic pollutants were created. (page 18)

- The Puff/Plume code has been modified to include contributions from deposition (ground shine) and cloud (cloud-shine). This changes satisfies the recommendations for Protective Action Guides and Protective Actions. (page 18)

- The finite element model, which simulates the Savannah River hydraulics from the New Savannah Bluff Lock and Dam to the Interstate Highway 95 bridge, has been completed. (page 18)

Waste Management

- A structural evaluation of dewatered transuranium drums shows handling and storage of these drums over a 20-year period is not a concern. The study assumes a drum corrosion rate of 2 mils/year, storage stacked three high in weather enclosures, and handling by the drum top chime or side. (page 19)

- SRTC will play a vital role in the success of the Defense Waste Processing Facility (DWPF) waste qualification runs. Preparations for a dry run of the canister handling, testing, cutting, and storage facilities have been completed. (page 19)

- A new nitrite concentration limit has been developed for the contents of the DWPF recycle collection tank (RCT). A simple linear equation has been calculated to relate nitrite concentration for protecting carbon steel to the nitrate concentration in the RCT. (page 19)

- Tests were performed to estimate the amount of dispersible particles generated during transport of the in-tank precipitation spent filter box for final disposal. This data supports development of the Transportation Safety Analysis Report. (page 20)

- A task team study for reducing DWPF recycle to the Tank Farm was completed as scheduled and alternatives for further study and evaluation have been transmitted to the High-Level Waste (HLW) Chief Engineer (WSRC-TR-93-0677). (page 20)

- The SPEEDUP® High-Level Waste Flowsheet Model continues to grow towards the vision described in the customer's software requirement specification. Over the past month, the basic model has been expanded from 8 to 27 chemical com-

ponents. New subsystem models are also being generated in parallel in preparation for a general integration of all models in the next month or so. (page 22)

General

- The Westinghouse Savannah River Company (WSRC) is supporting Westinghouse Electric Corporation (WEC) with PDR600 core physics predictions for the Phase Ic effort. Core physics efforts for Phase Ic were documented and sent to WEC by the mid-December report milestone date. The WSRC report input was accepted by WEC project leadership with only a few editorial changes. Planning has proceeded for Phase Id efforts that will continue to the end of May 1994, after that all task participants will meet with DOE for formal presentations. (page 23)

- The Defense Nuclear Facility Safety Board raised questions at Pacific Northwest Laboratory (PNL) about the adequacy of the assay technology for analyzing radioactive waste boxes for transuranic elements. Dr. T. G. Williamson visited PNL on December 14-15, 1993, as chair of an external independent review panel. (page 23)

- Packaging and Transportation Group (P&TG) recommended the Nuclear Regulatory Commission (NRC) certified TRUPACT-II packaging for shipping Separations Equipment Development (SED) traps to the site burial grounds. P&TG and project operations personnel are working out details regarding handling and preparation of the SED traps for containment in the TRUPACT-II. Application to the NRC for an exception to the Certificate of Compliance will be necessary for shipment of any trap containing more fissile material than permitted by the certificate. (page 23)

- Work has been completed and documented (SRT-TML-940004) on the determination of unmitigated radiological releases for SRTC Safety Analysis Report/ (SAR/BIO) postulated process-related and natural phenomena accidents to support the SRTC Functional Classification program.

- A first-stage assessment has been made of the impact of chemical inventories on the Functional Classification of SRTC. The ratio of released concentrations of both carcinogenic and non-carcinogenic chemicals to guidelines has been determined. Further work to complete this analysis is being scoped.

- A program has been initiated to determine the natural phenomena hazards and structural qualifications of SRTC facility structures, systems and components.

- An interpretation (SRT-TML-940001) was issued for the SRTC Operating Safety Requirements (OSR) to clarify LCO 3.2.4, Building 773-A Section F exhaust system. Implementation of the interpretation allowed the facility to exit the action statement and avert having to shut down operations. As a followup to the interpretation and to address other issues that have been identified at SRTC, a revision to the OSR is also being prepared. (page 24)

Tritium

Single-Bed Loading Status

W. N. Posey, E. F. Dyer, and T. J. Warren

The gas manifold used for single-stage loading tests in Building 774-A was modified to permit high-temperature/high-pressure D_2 desorption isotherm tests of the full size $LaNi_{4.89}A_{10.11}$ bed at a wide range of D/M ratios. The capability added to the low-pressure side of the manifold includes a 2.12-liter and a 16.56-liter calibrated volume, a new vacuum system, a thermocouple vacuum gage, and additional thermocouples. These modifications will permit D_2 loading with accurate volumes, D_2 desorption with capability to collect and reuse the D_2 on the bed, and accurately measured D_2 desorption/drawoffs to obtain a wide range of D/M ratios for conducting D_2 desorption isotherms.

The bed will be reloaded with D_2 in the near future and D_2 desorption isotherms will be obtained at high temperature/high pressure.

Tests reported earlier on this bed, which may be used in one of the loading lines of the Replacement Tritium Facility (RTF), showed that several units can be loaded simultaneously to a pressure of 1700 psia with the bed heated to 160°C, when the D/M ratio is ~1.0.

Terrazzo Reclamation

T. J. Warren, K. M. Rehberger, and E. A. Franco-Ferriera

Initial stem drilling tests began in the cold deuterium development facilities in Cubical J in Building 723-A. Fill stems and mockup units in a sealed, windowed fixture can be internally pressurized to simulate real reservoir conditions and determine the effects of pressure differential on hole size and shape. Connection of the fixture to the gas manifold permits measurement of gas flow rates and quantities and of pumpout rates through the drilled hole.

During a trip to the Pantex site, E. A. Franco-Ferriera and K. M. Rehberger obtained data on a similar laser drill/weld process developed there that will greatly aid in developing a successful process at SRS. Suggested modifications to the laser are being pursued.

Potential welding problems from ^3He effects in T_2-exposed fill tubes will be investigated using exposed stems. Calculations were made to determine ^3He profiles in returning reservoirs and in various shelf storage samples. T_2-exposed stems and certain reservoirs in shelf storage have been identified as having ^3He profiles near the ranges of interest. Additional test stems loaded for accelerated aging could be used for additional drilling and welding prove-out tests.

Several meetings with Tritium Department groups and tours in Replacement Tritium Facility (RTF) led to a change in the choice of the preferred location for a reclamation capability in RTF. This choice specifies reclamation in part of a currently unused loading line. Use of either existing unloading station was ruled out as not practical. The current proposal has been docu-

mented (SRT-HTS-94-0017) to provide input to the submission of a Schedule 44 in time to pursue capital funding on the required budget cycle.

Reservoir Chloride Contamination

K. A. Dunn

An inappropriate decontamination solution containing a household bleach was used on protective caps for reservoirs in the Tritium Facility between June 1993 and December 1993. The question was raised whether the cleaning solution posed any risk of corrosion for the reservoirs that came in contact with these caps. A series of tests (discussed in the next article) were conducted using various analytical techniques including neutron activation, x-ray fluorescence, energy dispersive spectroscopy, and auger electron spectroscopy. Based on the analytical results, it has been concluded that corrosion, as a result of the cleaning solution in question, will not occur on any of the reservoirs that came in contact with the caps.

Sections in Savannah River Technology Center (SRTC) involved in the analysis of the chlorine contamination included the Analytical Development Section, the Materials Technology Section, and the Hydrogen Technology Section. The data and a detailed explanation of the work are recorded in memo SRT-HTS-94-0014.

Chlorine Analysis of Protective Cap Decontamination Study

C. L. Shelor, S. B. Rhodes, and P. L. Morgan

Plastic caps are used on reservoirs to protect the integrity of fill stems. Tritium Operations in Building 234-H decontaminates and recycles these plastic caps. A solution of water, oakite, and chlorine bleach followed by water rinsing has been used to decontaminate some of the caps. A concern was raised that the caps may retain some chlorine from the cleaning solution that could leach out to the reservoir where contact is made between the reservoir and the cap.

Materials Training Facility (MTF) received four sets of test samples from Tritium Operations to analyze for the presence of chlorine. Test 1 consisted of test stems with the protective caps in place. The caps had been through varied cleaning conditions, air dried, and then screwed onto the test stem. The area on the base of the stem where the cap makes contact is the analysis location.

Test 2 consisted of identically treated samples as Test 1, but were aged for three days. Results from energy dispersive x-ray spectroscopy (EDS) revealed no evidence of chlorine on any of the tests stems.

Test 3 comprised of tubing samples of stainless steel and aluminum, which were subjected to various cleaning procedures. Only the samples that were cleaned with the solution and not rinsed showed trace amounts of chlorine, less than 1%.

Test 4 consisted of two stainless steel coupons. For the standard coupon, fingerprints were intentionally placed on it to simulate handling reservoirs. The second coupon was cleaned with solution, rinsed with water, and air dried. Auger electron spectroscopy (AES) was used to analyze for the presence of chlorine on the surface of the coupons. Results demonstrated that the surface of the stainless steel coupon retains no more chlorine from undergoing the cleaning process, than by merely handling it with one's hands, which is accepted practice with reservoirs.

Replacement Tritium Facility In-Bed Accountability Support

J. E. Klein

The Replacement Tritium Facility (RTF) in-bed accountability (IBA) process will be used to determine the amount of tritium stored on the 233-H metal hydride beds by measuring the steady-state temperature rise differential temperature (DT) of a gas flowing through the nitrogen jacket of a bed. To "calibrate" the beds for the IBA method, different amounts of tritium are loaded onto the bed to develop the DT versus tritium loading (grams T_2) correlation for each bed. An investigation is in progress to determine the minimum number of calibration points (DT versus bed loadings data) needed to obtain high IBA accuracy. By determining the minimum

number of calibration points needed, cost and time associated with calibrating a bed can be greatly reduced.

Results from the SRTC IBA development program were analyzed to estimate the number of calibration points that will be required for RTF IBA calibrations. One data set obtained under RTF-like conditions was analyzed to develop a bed IBA calibration error versus N (number of calibration points) correlation. Preliminary results show that using six or more calibration points gave sufficiently high IBA calibration accuracies.

Requiring six calibration points for an IBA bed calibration, instead of the original nine, will reduce the total number of IBA calibration points to be run in RTF by 24. This will significantly reduce the cost and time needed to implement IBA in RTF. This analysis will be documented in a Westinghouse Savannah River Company (WSRC) report.

Nonnuclear Consolidation Support

A. F. Riechman, K. M. Keeler, Y. K. Lutz, K. A. Dunn, and J. V. Cordaro

Revisions to the conceptual design for nonnuclear consolidation at Savannah River Site (SRS) are being investigated due to budgetary constraints. DOE-SR has requested a revised "high spot" estimate for the Nonnuclear Consolidation mission at SRS to be provided to them by January 21, 1994 to support their efforts. SRTC is supporting the cost reduction effort by assisting in revisions to the existing design and scope.

Changes being proposed for the project are

- reducing the number of bell jars in RTF from three large ones to two (one large and one small)
- relocating all RTF functions except environmental conditioning cells to vacate the north bay (thereby eliminating requirements for the mezzanine and heating, ventilation, and air conditioning (HVAC) upgrades)
- descoping loading line 6 (LL6) from the Nonnuclear Consolidation Project and performing that work elsewhere (potentially LL5 and room 32)
- reducing the number of environmental chambers and changing some chambers to thermal ovens
- storing more units per secondary container to cut container requirements.

These changes and the related cost savings will hopefully allow SRS to be cost competitive versus Los Alamos and retain the new mission assignments that are being transferred from Mound.

Separations

F-Canyon Safety Analysis Report Addendum

P. L. Fisk

The F-Canyon Safety Analysis Report (SAR) Addendum was approved by DOE-SR on December 10, 1993. The addendum is one part of the upgraded safety documentation required for restart of F Canyon. It provided revised nominal and maximum source term, as well as new consequence calculations that incorporated improvements to AXAIR89Q, the airborne release code.

H-Canyon Modeling

R. A. Pierce, J. D. Clark, and T. Waldrop

Savannah River Technology Center (SRTC) demonstrations of H-Canyon processes are complete. This program used operational models as training aids for Canyon personnel. The operation of the models was videotaped so training videos can be developed. Four processes have been simulated: fuel-rod dissolution, solvent extraction, batch evaporation, and ion exchange.

Final editing of the ion exchange and evaporation videos was conducted this week. Copies are being made for those in the Canyon responsible for training. The dissolution and solvent extraction videos were completed. The completion of this project closes out an SRTC milestone ahead of schedule.

Tomsk Explosion Parameter Studies

W. S. Cavin, M. C. Thompson, and J. D. Clark

In April 1993, a radionuclide separation facility in Tomsk, Russia, experienced an explosion in a processing tank that severely damaged the facility. The event was subsequently investigated by a Department of Energy (DOE) task team. As an outgrowth of that investigation, work is going on at several DOE sites to model the chemistry and understand the conditions that led to the explosion. Experimental work at SRTC is part of that effort.

The explosion at Tomsk was initiated by the addition of concentrated nitric acid in the absence of mixing. The nitric acid is believed to have concentrated in close proximity to the floating organic layer in the tank, and reacted vigorously with constituents in this layer. A mixing study was conducted to simulate and understand the mixing patterns present in the tank at Tomsk.

Tank conditions were simulated in a 3-foot high, 17.25-inch diameter Plexiglas tank. Surrogate solutions were chosen to simulate the mixing characteristics. A sodium chloride solution was used to simulate the aqueous uranium solution in the tank. The floating organic layer was simulated using a tributyl phosphate/cerium nitrate solution. Water colored with methyl violet simulated the concentrated acid addition to the tank. The solution-specific gravities were chosen to reproduce the density differences of the phases believed to be present in the tank.

Two different experimental runs were conducted as part of the mixing study. In the first run, colored water was dropped from a distance of 3.8 feet until ~30 liters were added. In the second run, colored water was added from an initial height of 1.4 feet above the liquid level. A floating organic layer was not used in the second run. Concentrated acid solution was added to the tank at Tomsk at ~30 gpm through 2.8-inch ID pipe from a height of ~7 feet.

From the results of the two experiments, it is concluded that the nitric acid, which was added to the tank at Tomsk, would have concentrated in a relatively thin strata below the floating organic layer. This could have resulted in concentrated nitric acid in direct contact with the organic layer.

Environmental

Samples Delivered to University of Georgia for Tritium Analysis

C. E. Murphy, Jr.

Savannah River Technology Center (SRTC) and Environmental Sciences Section (ESS) is working with Dr. R. Kalin of the University of Georgia, Center for Applied Isotope Studies, to determine the beginning of tritium releases into the tributary of Four Mile Branch that has its origin in the Solid Waste Disposal Facility (SWDF). The drainage area along the tributary is heavily forested with some trees that were on the site when Savannah River Site (SRS) was established in 1952. Cores have been removed from five trees and four cross sections were removed from a single tree. The cores and cross sections were delivered to Dr. Kalin on December 20, 1993. The material will be processed to obtain wood from rings grown in each year. After processing to remove the more mobile constituents of the wood, the tritium bound in the wood will be measured. It is anticipated that a clear signal of elevated tritium content will be present in all rings beginning with the first year that seepage from the SWDF raised the tritium levels above the local background.

Sanitary Landfill Bioremediation Treatability

T. Hazen, C. Fliermans, K. Lombard, D. Jackson, C. Berry, and M. Franck

Biotechnical Group personnel of ESS continued operation of four sediment columns for the Environmental Restoration Department's Work Authorization Document. Eight stainless steel columns 4 ft × 4 in. were used to simulate four treatments. Data to date show methane-stimulated microbes are capable of degrading concentrations of trichloroethylene and volatile compounds over 100,000 ppb to less than 100 ppb in 14 days. The project will be completed at the end of January.

Fourth International Conference on Chemistry and Migration Behavior of Actinides and Fission Products in the Geosphere (Migration '93)

C. E. Murphy Jr. and K. Jerome

On December 14, 1993, a poster session was presented at the Migration '93 Conference in Charleston, South Carolina. The poster session illustrated work done to establish the radionuclide content of vegetation growing on the SRL Seepage Basins. The measurements were made as part of the WSRC/ER basin closure project.

In addition to the radionuclide concentrations needed for the closure plan, the results of the measurements provided some insight into the processes that control transport from the basins to the vegetation. The results have been combined into a database used to evaluate similar situations at SRS.

Pen Branch Migration Action Plan

E. A. Nelson

Phase I planting for the Pen Branch reforestation program has been completed. The upper corridor area of Pen Branch, which was treated with herbicide in the early fall, was burned with a controlled fire to improve access and movement of the planting crew in the area. The area was planted in late December with a mixture of bottomland oak and hickory species, green ash, beech, tupelo, and persimmon according to the observed elevation of the areas in the corridor.

Approximately 41 acres were planted this winter and this activity completes the initial planting of the corridor area. Monitoring plots in each of the planted areas and untreated controls areas are in place or will be established soon. A natural regeneration survey of the delta and its tail is currently underway to quantify the acreage, distribution, and magnitude of natural regeneration in the lesser damaged areas of the delta. This will assist in determining the extent of credit that can

be claimed for natural restoration against the goal. The survey crew is actively continuing with the topographical survey of the swamp that will provide data for the hydrological model of the Savannah River Swamp System and give an indication of the problems that could exist in planting the delta region next winter.

Lower Three Runs Instream Flow Study

B. R. del Carmen and M. H. Paller

An instream flow study was conducted to identify the minimum discharge from Par Pond that will support a balanced biological fish community in Lower Three Runs. Hydraulic and habitat models of the Physical Habitat Simulation System (PHABSIM), the major component of the United States Fish and Wildlife Service's Instream Flow Incremental Methodology (IFIM), were applied. Following calibration of the Water Surface Profile (WSP) model for three different study reaches, hydraulic data were combined with the AVDEPTH habitat model to develop relationships between discharge and available habitat.

Hydrologic Analysis of Steel Creek and L Lake

B. R. del Carmen and M. H. Paller

In support of a proposal to eliminate the environmental impact study mandated for spring flow requirements in Steel Creek below L Lake, a hydrologic analysis of Steel Creek and a water balance study of L Lake were performed. The base flow in Steel Creek below L Lake was estimated using historical data. The water balance of L Lake was studied to evaluate the effects of flow reduction on the Steel Creek hydrologic system. A reduction in L-Lake discharge to base flow conditions will result in a fish community similar to the one that existed before the impoundment of L Lake.

Liquid Pathways Contaminant Transport Analyses to Support In-Tank Precipitation H-Area Safety Basis

G. P. Flach

Geotechnical characterization of the H-Area Tank Farm in 1992 indicated the possibility of soil liquefaction and/or settlement during a seismic event that might cause differential tank settling. Sufficiently large differential settlement could cause tank structural failure followed by a liquid radioactive waste release. To assess the exposure risk associated with this scenario, an integrated geotechnical, structural, and safety analysis program has been initiated. Environmental Sciences Section (ESS) is supporting the overall program by evaluating the exposure consequences of liquid waste releases at the ground surface and below grade. A draft task plan has been prepared and incorporated into the overall program.

Resin Wash Analysis

C. J. Berry and M. M. Franck

Personnel from the Biotechnology Group of ESS performed work on a resin wash for TNX/Interim Waste Technology Division (IWT). Microbial analysis indicated there was no effect on the aerobic viable bacteria by the wash. The liquid sample has a high TOC and potassium concentration. IWT performed analysis on the sample before, during and after the microbial testing.

Dosimetry Technical Support

D. M. Hamby and A. H. Weber

A dose assessment was completed that evaluated the risk from plutonium released to the atmosphere from F Area on December 27, 1993.

The dose at the site boundary was 0.0021 mrem, which is equivalent to the natural background dose received every three minutes.

Cost-Benefit Analysis for Environmental Remediation

D. M. Hamby and A. H. Weber

A literature search has begun for work on cost-benefit analysis in radiation protection. A review is also taking place of the decision-making tools available to risk managers in the Superfund remediation arena. A talk is planned for the DOE labs risk assessment forum on the tools available to decision-makers and those necessary for the most effective and efficient remedial alternative.

Semivolatiles Analysis Lab Setup

J. C. Griffin

Environmental Restoration (ER) and other departments have expressed a need for semivolatiles organics analysis (SVOA) capabilities at Analytical Development Section (ADS). Laboratory space was designed and built for SVOA capabilities, and equipment is being ordered in preparation for the start of this laboratory. Two gas chromatograph/mass spectrometers are expected to arrive in February (the purchase requisition was submitted in May 1993). Other high priority supplies for the SVOA laboratory include a sample storage refrigerator, which arrived in late October, extraction equipment to prepare samples, and analytical standards. In addition, parts of routine instrument maintenance will be ordered to be available as needed.

Magnetic-Separation Demonstration Support

R. L. Nichols, C. A. Eddy-Dilek, B. B. Looney, M. Denha, and S. McMullin

The scope of work (SOW) for cone penetrometer services for the Magnetic-Separations (Mag-Sep) Demonstration was completed and submitted into the procurement system. The SOW made it to procurement and a meeting has been scheduled with EBASCO to discuss the work.

A conceptual model of the Mag-Sep system was developed and reviewed with the Environmental Protection Department (EPD). EPD indicated that permitting the Mag-Sep demonstration should be straightforward based on the conceptual model. A meeting with South Carolina Department of Health and Environmental Control (SCDHEC) was scheduled for January 26, 1993.

Six-Phase Heating Demonstration

T. Jarsoch, S. Burdick, K. Lombard, C. Eddy-Dilek, and B. Looney

The heating stage of the six-phase ohmic heating demonstration has been successfully completed. Continuous heating was concluded on December 30, 1993, after approximately three and one half weeks of power output to the electrodes. The six-phase *in situ* heating technology was developed by Pacific Northwest Lab (PNL) researchers; Environmental Sciences Section (ESS) provided field support in the areas of characterization, soil and offgas analysis, installation, and offgas equipment operations. Subsurface temperatures of the targeted clay within the electrode array pattern were sustained over the final half of the heating stage at levels at or slightly exceeding 100°C. The heating resulted in a total of nearly 14,000 gallons of steam condensate recovery. The steam generation and removal is an important process of *in situ* heating applications, offering both a potential for enhanced stripping of residual solvents, and an increase in the permeability of the sediments. Initial analysis of the change in airflow from the extraction well and changes in piezometer readings measured both within and outside the heated pattern indicate a significant change in the permeability of the clayey sediments. Vacuum extraction was continued through the remainder of the week until steam recovery rates had dropped to approximately 20% of the maximum levels. Current plans call for drilling to begin in December to obtain "hot" sediment core samples for interim characterization.

Characterization and Monitoring

J. Rossabi and C. Eddy-Dilek

Post-test characterization of the ohmic heating demonstration site was initiated on December 13, 1993. Five continuous cores were collected directly adjacent to the locations of selected pretest borings, specifically, the central vent, three observation wells, and one electrode. These samples were collected while the sediments were still heated (approximately 80°C) in order to collect samples that are as representative as possible of post-heating conditions.Two additional borings will be collected in January after the ground has cooled significantly. Continuous cores were collected and selected sediment samples will be analyzed for volumetric moisture content as well as volatile organic contaminants content. Analysis of the sediment samples collected during the pretest characterization is completed and a report will be furnished to PNL for their evaluation of the remedial demonstration.

An overview report on characterization and monitoring technologies that were developed as part of the Integrated Demonstration was completed on December 30, 1993. The report summarizes the results of field demonstration of the following new technologies for measurement of physical parameters: *in situ* permeable flow sensors and the colloidal borescope for measurement of groundwater flow; and seismic, electrical and electromagnetic tomography for three-dimensional imaging of physical changes induced by the remedial process. New technologies for depth discrete sampling discussed in the report include the passive multilayer groundwater sampler and the arrayed vadose zone sampler. Innovative technologies for chemical analysis include a fiber optic trichloroethylene (TCE) sensor for remote detection of TCE and chloroform; the portable acoustic wave sensor (PAWS) and the HaloSnif for continuous, online measurement of total chlorinated compounds over a wide dynamic range; and the direct sampling ion trap mass spectrometer (DSITMS) for compound specific determination of organic analytes at concentrations down to ppb levels.

Offgas Treatment Technology Demonstrations

J. Haselow, T. Jarosch, and J. Rossabi

An interim technology evaluation report on offgas treatment technologies was completed on December 31, 1993. This completes a milestone calling for an interim report. The final report will be issued in August 1994. The interim report discusses the nine technologies for which testing had been completed as of November 30, 1993: Synthetica's carbon regeneration system, Nutech's photocatalytic oxidation system, the University of Wisconsin's photocatalytic oxidation system, Ultrox's ozone catalytic oxidation system, Purus' Xenon flashlamp system, Johnson and Matthey's thermal catalytic oxidation system, NuCon's carbon regeneration solvent recycle system, PNL's high-energy corona system, and LANL's cold plasma technology.

Dense Nonaqueous Phase Liquid Program

C. Eddy-Dilek, B. Looney, and J. Rossabi

The scope of work for an interagency agreement between the United States Geological Survey (USGS) and DOE was developed and delivered to the DOE Headquarters program manager. The scope outlines the roles and responsibilities for geophysical characterization work that will be performed in the A/M Area to help detect and delineate Dense Nonaqueous Phase Liquid Program (DNAPL) contaminants in the subsurface. The work will be completed in three phases; initial feasibility studies, contingency feasibility studies, and remediation monitoring. The work will include; interpretation of existing log data, lab studies of electromagnetic properties of core, borehole radar monitoring, lab and field studies of complex resistivity resulting from clay-organic reactions, surface and borehole seismic feasibility and field tests, neutron logging to determine porosity and DNAPL location, and other monitoring to be determined.

Communication has begun with a professor at the University of Vermont for the possibility of performing collaborative work on DNAPL characterization. The professor has a DOE Environmental Restoration and Waste Management Junior Faculty fellowship to research the removal of DNAPL using solvent flushing. A meeting has been scheduled at SRS to explore areas of common interest and leverage resources to maximize results for both the fellowship and for this technical work.

A meeting was held with faculty from Clemson University to outline the goals of research to detect and remove DNAPLs in the subsurface. The work will consist of the following; development of gas flow and transport analytical models during vapor extraction, development of numerical models of alcohol and surfactant flooding, laboratory studies of alcohol and surfactant flooding, and subsequent development of engineering parameters for scale-up, and lab experiments to determine pressure-saturation curves for A/M area soils.

Gas Phase Bioreactor

C. Berry

C. Berry met with ECOVA onsite and examined the A-14 outfall and site support facilities. Construction on the gas phase bioreactor system has begun and is on schedule. C. Berry will travel to Seattle the second week of February to perform a technical evaluation of the system. The system should arrive onsite for start up the last week in February.

Continuing Corrective Actions for the 1993 Continuing Corrective Actions Report of the Environmental Technology Section Meteorological Monitoring Program

M. J. Parker

The final corrective actions for the 1993 Continuing Corrective Actions Report (CCAR) were completed this month. The two-meter temperature probe at the WJBF-TV tower monitoring facility was relocated to a position that is less influenced by solar heating of nearby buildings. New procedures were developed for the calibration of the Environmental Technology Section (ETS) wind tunnel (ETSP T-111), the verification of anemometer cup assembly performance (ETSP T-112), and the verification of the transfer of backup data logger data to the final annual or five-year database (ETSP T-310A). All of the corrective actions have been made, and another audit to verify the implementation of the corrective actions is expected in January.

Environmental Transport Group Support of European Tracer Experiment

J. D. Fast and D. P. Griggs

The SRTC is one of three organizations in the United States participating in the realtime modeling portion of the European Tracer Experiment (ETEX). Environmental Transport Group (ETG) personnel met with the Cray support team to discuss options for ensuring the Cray performance needed for ETEX. Previous modeling studies showed that the Regional Atmospheric Modeling System (RAMS) forecast could be completed within the required four to five hours on the Cray. The Cray support team outlined a process wherein the Cray would be placed in a dedicated emergency response mode during the ETEX dry run. In this mode, the Cray would be unavailable to all batch and interactive users other than those performing ETEX analyses.

The second ETEX dry run for realtime modelers was conducted on December 7, 1993. A "prealert" facsimile for the second dry run was received on December 6, 1993; the confirmatory facsimile with the release location (Nancy, France), time (15 UTC), duration (six hours), and size (10 g s-1) was received on December 7, 1993. To ensure completion of a forecast within the allotted time, parallel RAMS analyses were initiated on the SRS Cray and an ETG IBM RISC workstation. These redundant 66-hour forecasts were essentially identical, using a uniform 100-km horizontal spacing and initialization fields based on weather over the European continent from 00 UTC on December 7, 1993. As planned, the Cray was placed in a dedicated emergency response configuration. This process worked well, allowing the RAMS analysis on the

Cray to be completed by the early afternoon. The three-dimensional wind fields from this forecast were then used in the particle model to predict the dispersion of the plume.

In addition, other simulations were performed as specified in the ETEX Technical Specifications Document and the results provided later on a floppy diskette. A total of five additional simulations were required including four updated forecasts beginning at 12, 24, 36, and 48 hours after the release time, as well as one 60-hour forecast from the time of the release using analyzed meteorological data from the entire 60-hour period. The additional five simulations were executed since the dry run and the required results were transmitted on diskette accompanied by memorandum SRT-ETS-931531.

Air Quality Modeling /Spent Nuclear Fuel Environmental Impact Statement

J. Stewart

Air quality modeling work carried out in December was focused on providing support for work on the SRS contribution to the Environmental Impact Statement (EIS) for the spent nuclear fuel project.

The types of support comprised:

- The ETG databases containing AEI data were used to identify pollutants currently emitted from specified stacks in F and H Areas and to create reports for use by engineers.
- Six new databases were set up to access over 200 files of pollutant data developed by EPD specifically for use in the modeling for the EIS.
- The data files were subjected to quality assurance requirements as they were loaded and reports were generated listing deficiencies to be corrected. Numerous files containing data for different dates were merged to create the source data to be analyzed.
- Source records were assigned new source identifiers based on hours of operation.

Model input files for six criteria pollutants and 23 toxic pollutants were created.

Ground Shine and Cloud Shine Added to Puff/Plume Comparison

R. J. Kurzeja

Puff/Plume is a Gaussian model used by ETS for emergency response and hazards assessment. It calculates the downwind doses from releases of radioactive chemicals. The largest contribution to an individual's dose is from inhalation but radiation from chemicals deposited on the ground and from nearby airborne clouds can sometimes be significant. The Puff/Plume code has been modified to include contributions from deposition (ground shine) and clouds (cloud shine). This change satisfies EPAs recommendations for Protective Action Guides and Protective Actions.

FESWMS-2DH Models Savannah River

K. Chen

The finite element model, which simulates the Savannah River hydraulics from the New Savannah Bluff Lock and Dam to the Interstate Highway 95 bridge, has been completed. The hydraulic conditions of the Savannah River for the 1990 and 1991 dye trace studies were simulated by FESWMS-2DH model. The calculated average flow velocities between the sampling stations along the Savannah River agree with the measured data within 7% except the data measured at the City of Savannah pump station. The discrepancy at that location is 59%. The flow velocity at the City of Savannah pump station was affected by tidal effects, which were not simulated by the present steady-state model. This discrepancy will be improved when a dynamic model is used.

Waste Management

Structural Evaluation of Dewatered Transuranic Waste Drums

L. Williams

A study predicting the structural integrity of dewatered Transuranic (TRU) waste drums is complete. This study shows drums weighing 900 lb, separated by wooden pallets, and stored three high in weather enclosures will maintain their structural integrity over 20 years. This prediction is based on a maximum steel corrosion rate of 2 mils/year, and assumes the drums are dry and contain no holes before storing. Another assumption is the drums are handled either by the top chime with a crane or side lifted with a fork mounted grabber. Finally, a dynamic load factor of two was assumed. This is equivalent to lifting drums weighing 1800 lb, provided the drums are lifted slowly.

The 900-lb drum weight is based on DOT type 7A drop tests. This weight is conservative since the average TRU waste drum at the Savannah River Site (SRS) weighs about 131 lb.

Preparations for Defense Waste Processing Facility Waste Qualification Runs

D. T. Herman and J. R. Harbour

Savannah River Technology Center (SRTC) will play a vital role in the success of the Defense Waste Processing Facility (DWPF) waste qualification runs. Preparations for a dry run of the canister handling, testing, cutting, and storage facilities have been completed.

When the DWPF begins its waste qualification runs, SRTC will be responsible for the detailed characterization of the canisters produced. SRTC will receive them at TNX, perform tests for foreign materials and weld integrity, determine the fill height, cut open the canisters, and take glass samples. These samples will then be characterized by leach testing, chemical composition, and phase identification. These tests will receive extremely high visibility; both because of their expense, and the importance of the test results. DWPF will not be able to begin operation unless these tests are a success.

Although SRTC has previously performed each of the operations described above, it has never performed them in an integrated manner. A further complication is that SRTC has never tried to perform so intricate a series of tests on so tight a schedule in a sustained manner. A dry run will be performed next month to test the integrated operations of these systems.

This month, all preparations have been completed for this testing. The value of the dry run concept was proven when it was discovered that the crane at TNX could not satisfy site standards for this service. The necessary parts have been procured and installed. A canister dimensional gage has been fabricated and calibrated. Modification and load testing of a canister grapple is complete. We do not expect that we will pass the dry run unscathed (but we hope we will!). However, by going through this dry run now, we minimized the potential for a embarrassment when qualification runs begin.

Defense Waste Processing Facility Recycle Stream Corrosion Tests

P. E. Zapp

Contaminated waste water generated in the DWPF will be accumulated in the recycle collection tank (RCT). Inhibitors will be added to the RCT and the inhibited waste then transferred to Tank 43 in the H-Area Tank Farm. Process Requirement DWPF-S08 sets limits on hydroxide and nitrite in the RCT so that the transferred waste will not cause pitting corrosion in the carbon steel Tank 43. Electrochemical corrosion tests were recently completed on simulants of the revised expected RCT composition.

The incorporation of ammonia scrubbing into DWPF operations will result in a five-fold increase in the nitrate concentration in the RCT. Since nitrate is the chief corrosive anion in the recycle stream, cyclic potentiodynamic polarization scans were conducted on specimens ASTM A537 carbon steel (the material of construction of

waste tank primary plates) at 90°C in simulated, high-nitrate recycle solutions. The nitrate concentration of the simulants 0.01, 0.05, and 0.1 M, the concentrations of other recycle components were taken from the most recent material balance for the DWPF flowsheet. The nitrite concentration was varied to determine the minimum level necessary to prevent pitting corrosion in the steel specimens.

Based on the minimum inhibiting nitrite concentrations at the three nitrate concentrations, a simple linear expression was calculated to relate the required nitrite concentration for protecting carbon steel to the nitrate concentration in the RCT. This expression has been incorporated into the revised Process Requirement DWPF-S08.

In-Tank Precipitation Spent Filter Box

L. L. Kilpatrick

Used in-tank precipitation (ITP) filters will be sealed in a Spent Filter Box and transported to storage within a three day period of being welded shut. During storage, the internal pressure of the box will be released to the atmosphere through a high efficiency particulates air (HEPA)/carbon filter. High-level Waste Engineering (HLWE) asked (HLE-TTR-93083) Interim Waste Technology (IWT) to estimate the fractions of dried precipitate, generated in box during transportation to storage, that became airborne.

The Packaging and Transportation Group (P&TG) calculated a permissible leakage through various defects in the 2-inch thick containment box lid for the given vertical air velocity, particle sizes, and concentration of particles in the box. About 0.60 grams of dried dislodged solid particles smaller than 165 micron size can be tolerated and still meet the acceptable leak rate.

Significant amounts of particles smaller than 180 micron were generated from the thicker of two dried ITP simulated slurries when the material was shocked and shaken in a manner that simulated transport of the Spent Filter Box to storage. No particles less then 180 microns were produced from the thinner cake.

The high molecular-weight, polyacrylate polymer sorbents planned for use in the Spent Filter Box should decrease ability of dried precipitate to break up into aerosol particles during transport. These sorbents have high capacity for simulated slurry and only a small fraction is less than 150 micron (dry form).

Defense Waste Processing Facility Recycle Minimization

R. A. Jacobs and Recycle Minimization Task Team

A task team study for reducing DWPF recycle to the Tank Farm was completed as scheduled and transmitted to the HLW Chief Engineer (WSRC-TR-93-0677). These options are not necessarily recommended for implementation but for further evaluation and study.

A task team consisting of representatives from DWPF, HLWE, IWT, and DWPT was chartered by F. F. Cadek to study alternatives that reduce DWPF recycle to the HLW evaporator system and to select alternatives for further development and/or engineering study. As chartered, the scope of the study was limited to DWPF. A separate study is needed to identify and evaluate alternatives in other areas (for example, the Tank Farm or Separations areas) that might have greater impact or be more cost effective.

Note: All projected savings are based on 100% attainment and are compared to an updated material balance that includes the latest estimates of primes, flushes, film cooler steam requirements, etc. The 100% attainment recycle flow is 7.56 gpm.

Group I Options

Group I options are low to medium impact alternatives that should be evaluated and/or implemented regardless of the success of Group II or Group III ideas since it is prudent to reduce the water flow to the Tank Farm and reduce the load on Effluent Treatment Facility (ETF) and consequently preserve the ETF capacity for future needs. Implementation of Group I alternatives

primarily require development work (calculations, small scale or large scale experimentation) with small (<$500,000) or no capital investment.

Table 1. Group I Options

	gpm
Reduce or eliminate PR heel pumpout	0.48
Run larger batches[1] (with PR heel pumpout)	0.56
Eliminate PR heel pumpout	0.37
Optimize SASs	0.70
Modify film cooler-to-quencher jumper[2]	0.60
Concentrated frit blasting (if "free")	0.20
Implement water conservation program[3]	0.30
	2.73[4]

1 Based on 2590 gallons precipitate slurry at 15 wt% and 5000 gallons sludge slurry at 19.6 wt%.
2 Cost of jumper estimated to be ~$300-400,000
3 25% of primes, flushes, etc.
4 Sum is for shaded area and does not include first item to prevent double counting the same savings

Group II Options

Group II options are medium to high impact alternatives that could divert significant amounts of recycle from the HLW system directly to the ETF, saltstone, or other SRS facilities. These alternatives involve treatment and/or alternate disposal of DWPF recycle. They require varying amounts of technology development and engineering cost/study estimates as well as considerable cost/capital to implement.

- Evaluate converting DWPF's RCT to an evaporator with overheads going to ETF
- If the DWPF evaporator option is not viable or feasible, evaluate
  - filtration and Ion Exchange (IX) of melter offgas condensate with disposal in ETF, and/or
  - routing of Slurry Mix Evaporator Condensate Tank (SMECT) condensate to the General Purpose (GP) evaporator in Separations
- Contact outside vendors in order to evaluate commercially available technologies.

Evaporation in DWPF is likely to divert 75 to 85% of the remaining DWPF recycle water (~ 4 to 5 gpm) directly to ETF without going through the 2H evaporator. Potential savings for both filtration/IX of OGCT condensate and for routing of SMECT condensate to the GP evaporator are about 2 gpm each in addition to Group I options.

Group III Options

Group III options are low to medium impact alternatives recommended for evaluation only if Group II options are not feasible/viable or do not provide sufficient volume reduction. Some of these alternatives may carry significant cost and, therefore, would not be cost effective when considered in combination with Group II, or even when considered individually.

Table 2. Group III Options

	gpm
PR condensate tank (remove OE)	0.4
Efficient antifoam addition	0.1
FAVC and OGCTC condensate to ETF or internal recycle	0.9
Concentrated frit blasting (w/cost)	0.4
Additional water conservation	0.2
Subtotal	2.0
Carryover from Group I:	
Larger batches	0.56
Offgas jumper	0.60
SAS optimization	0.74
Water conservation	0.30
Total	4.20

Note: Some items in Group III are mutually exclusive to Group I; therefore, only some Group I items are additive to Group III.

In addition to the recommendation, three new recycle algorithms were included that allow evaluation of DWPF recycle impact at varying

DWPF attainments and with implementation of some of the recommendations.

Integrated High-Level Waste System Model In-Tank Precipitation Module

T. Hang and K. L. Shanahan

A preliminary version of the SpeedUp® computer module for the ITP processing tanks is complete. The ITP module will be integrated into the Integrated HLW System Model. The HLW system model provides a primary tool to evaluate the system level impact of process alternatives and to conduct process troubleshooting and optimization studies.

The ITP module is a simplified version of the ITP facility model. This module currently contains 27 chemical components, and models Tanks 48, 49, 22, and 50 featuring precipitation, redissolution of NaTPB, and benzene generation. It provides an interface with Late Wash and the rest of the Tank Farm. Batch operation is controlled through the SpeedUp® EDI interface. At this stage, baseline ITP operation (i.e., three batches of wastes and a continuous washing phase) is included as the batch operation sequence. Work is under way to integrate the ITP module into the Integrated HLW System Model. The integration is scheduled to be completed by March 31, 1994.

General

Plutonium Burner Support

R. W. Rathbun, D. Biswas, and S. Y. Lee

Phase Ic core physics efforts for the Plutonium Disposition Study were formally documented for the PDR600 (AP600 with weapons grade mixed plutonium uranium oxide (MOX) fuel) optimization studies. Topics included studies for optimized fuel cycles, optimization on the number of reactor units required, extended burn cycles, and tritium production capability. A section was also included that spelled out details of the probable test assembly configuration and reactor core positioning. Additionally, at the request of Department of Energy (DOE), a section was included that listed the Westinghouse developmental needs for the Plutonium Burner Project. These documented core physics efforts for Phase Ic were sent to Westinghouse Electric Corporation (WEC) by the mid-December report milestone date. The report input was accepted by WEC project leadership with only a few editorial changes.

By mid-January 1994, Phase Id is set to commence. Westinghouse Savannah River Company (WSRC) core physics personnel are committed to studying the effects of burning the fuel to the licensable limit (48,000 MWD/MT), investigating the effect of increased integral burnable absorber along with zirconium cladding and studying the large 1420 MWe plant (non-passive) with full MOX fuel.

Phase Id is projected to end by the last week of May 1994. DOE is requesting that all participants meet at that time for formal presentations on the designs that have been developed by the five vendor groups.

Pacific Northwest Lab Technical Review Panel

T. G. Williamson

On September 20-22, 1993, representatives for the Defense Nuclear Facility Safety Board (DNFSB) visited Pacific Northwest Laboratory (PNL) and raised questions about the adequacy of the assay technology for analyzing radioactive waste boxes for transuranic elements. An external independent review panel consisting of Dr. T. G. Williamson, Senior Advisory Scientist, Westinghouse Savannah River Laboratory, Dr. S. E. Binney, Professor of Nuclear Engineering, Oregon State University, and Dr. J. F. Higginbotham, Associate Professor of Nuclear Engineering, Oregon State University, visited PNL on December 14-15, 1993. The panel confirms the findings of internal review panels, which the neutron sensing part of the assay equipment, is adequate to measure transuranic waste material at the specified limit.

Separations Equipment Development Facility Decontamination and Decommissioning Trap Shipments

T. K. Houghtaling

As part of Decontamination and Decommissioning (D&D) of the Savannah River Site (SRS) Separations Equipment Development (SED) facility, a number of transuranic (TRU) waste traps will be removed and shipped to the site burial grounds. The traps were integral parts of the facility and contain varying amounts of TRU-waste. For this onsite shipment from Savannah River Technology Center (SRTC) to the TRU pads, the Packaging and Transportation Group (P&TG) recommended TRUPACT-II from among five candidates. P&TG identified it as the safest, most straightforward to use packaging for the task. The TRUPACT-II is Nuclear Regulatory Commission (NRC) certified and readily available from the Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico. However, the Safety Analysis Report for Packaging (SARP) requires venting the traps and limits the amount of fissile material the TRUPACT-II can transport. The venting requirement is common to all DOE/NRC certified packagings to eliminate explosive concentrations of flammable gasses. Venting can be accomplished by fitting small HEPA filters to the glovebag(s) surrounding each trap and to one of the external closure plates that will be bolted over trap openings. If the project operations leadership agrees to implement the venting filters, and the assays of trap contents show fis-

sile material quantities as expected, then four of the six traps can be shipped under the existing Certificate of Compliance. Shipment of any trap containing more than the certified amount of fissile material will require an exception to the existing certificate from NRC. The application for exception will require a criticality analysis of the trap(s) and arguments supporting administrative control of access to SRS roads.

Savannah River Technology Center Safety Support

S. P. Tinnes, R. C. Edwards, C. L. Smith, P. K. Baumgarten, et al.

A program has been initiated to determine the natural phenomena hazards (NPH) and structural qualification of SRTC facility structures, systems, and components. S. Patel will act as the SRTC liaison to Engineering and Project Division (E&PD) structural mechanics. A meeting was held with E&PD structural mechanics and SRTC custodian representatives to discuss the scope, cost estimate and schedule to qualify SRTC for NPH mitigation. E&PD structural mechanics can make an interim preliminary evaluation of the SRTC facilities by walkdown screening during this fiscal year and make a detailed evaluation during the first six months of FY95. S. Patel and S. Tinnes will provide E&PD with a scope of work, including facility performance categories and equipment lists. E&PD will then conduct a quick walkdown of the facilities in order to finalize the schedule and the cost estimate for the seismic evaluation.

At the request of DOE, reconfiguration of SRTC to allow access for "uncleared" visitors is being evaluated (such as opening the SRTC library to the "General Public"). A SRTC reconfiguration committee has been appointed and is now active; it has representatives from various "stakeholder" groups. S. Tinnes is the PSTS-Safety representative. The committee is evaluating different reconfiguration options proposed by DOE that would reduce the SRTC limited area to a property protection area with pockets of limited areas. Each option has different security, radiation control, emergency preparedness, safety (SAR), cost, liability, and SRTC mission concerns. A proposal to DOE is due February 15, 1994.

Work has been completed and documented (SRT-TML-940004) on determining the unmitigated radiological releases for SRTC SAR/BIO postulated process-related and natural phenomena accidents to support the SRTC Functional Classification program. In the calculations, no credit is taken for engineered safety systems or structures.

As part of the interim Functional Classification of SRTC Technical Area systems, an analysis of the potential release of chemical inventories is in progress. The analysis includes comparisons of calculated onsite and offsite release concentrations with guideline concentrations obtained from available Emergency Response Planning Guides (ERPGs), ACGIH Threshold Limit Values (TLV) and OSHA Permissible Exposure Limits (PEL). Work on carcinogenic materials also includes determination of Inhalation Unit Risks and Risk Limits using EPAs Integrated Risk Information System (IRIS) database.

PST/TMLA&L personnel helped provide safety support for the SED facilities and participated in a number of meetings. M. L. Cowen presented a talk on the "Safety Risk of the SED Facility versus SRTC" to DOE-SR representatives on January 7, 1994.

Items of Interest

A. D. Yu attended the 4th International Conference on the Chemistry and Migration Behavior of Actinides and Fission Products in the Geosphere in Charleston, SC on December 12-17, 1993. A. D. Yu presented a poster "Control of Tritium Migration at the Savannah River Site", co-authored by J. R. Cook, R. A. Hiergesell, C. A. Langton, and E. L. Wilhite.

E. L. Wilhite, at the request of EM-30, made a presentation on data needs for radiological performance assessments at a meeting of the Low-Level Waste Management Program Data Management Work Group. The meeting was held on December 8-10, 1993 in New Orleans, LA.

J. R. Cook and E. L. Wilhite, at the request of Westinghouse Hanford, participated on a panel of experts at a meeting to develop a proposed performance assessment for vitrified low-level waste. The meeting was held on December 13-14, 1993 in Pasco, WA.

C. A. Cicero and M. J. Plodinec hosted the WSRC Solid Waste Vitrification Steering Committee at the Center for Glass Research at Clemson. Site solid waste plans were discussed, and a path toward an onsite demonstration of vitrification identified.

Meetings were held among SRTC, ORNL, Westinghouse SEG, and Oak Ridge Operations that will soon culminate in two CRADAs. One, for which J. C. Marrs is the lead, will concentrate on vitrification of ash (e.g., from SRS' Consolidated Incinerator Facility). Another, lead by C. M. Jantzen, will be directed at Oak Ridge mixed low-level waste. SRTC has received a letter of interest from the manager of Oak Ridge's K-25 facility.

J. Plodinec, C. Jantzen, and D. Bickford participated in a teleconference on DOE's Mixed Waste Integrated Program held in Washington, DC.

C. M. Jantzen and D. Bickford prepared a poster display dealing with waste vitrification and presented it at DOE-HQ.

R. Schumacher attended an organizing meeting for the DOE Technology Support Team helping smaller DOE sites meet the requirements of the Federal Facilities Compliance Act. The team is currently reviewing plans from Lawrence Berkeley and Brookhaven National Laboratory.

A Technical Information Exchange Meeting was hosted by the Efficient Separations and Processing Integrated Program in Dallas on January 10 and 11. Presentations were made by several IWT personnel on research efforts.

J. P. Bibler and D. J. McCabe, "Ion Exchange Pretreatment of Alkaline Radwaste for Cesium Removal"; "'Carbollide'/CDC Process Development for Radioactive ^{137}Cs Decontamination".

A press release was issued to the Aiken newspapers on the first CRADA established at the Savannah River Site between J. Rossabi of ESS and JND Sterling, Inc., of Atlanta. The article describes barometric pumping efforts at the Savannah River Site and the effort to enhance the barometric pumping technology with a modified solar collector system.

A patent disclosure was filed by ESS-Groundwater Group personnel (B. Pemberton, C. May, B. Riha, R. Nichols, J. Rossabi, C. Eddy-Dilek, and B. Looney) for an inexpensive multi-level, discrete-depth sampling system designed for rapid installation using the cone penetrometer. The device consists of a partially slotted port that is installed between sections of 1-inch conduit. This port is channeled to a sealed connector attached to a small diameter tube that is run through the conduit to the surface. More than 10 ports can be installed in each well. The port system will be used to track depth-discrete pressure changes in response to surface pressure fluctuations. The system will also be used to obtain depth-discrete contaminant concentration information.

A patent disclosure was filed by ESS-Groundwater Group personnel (C. May, B. Pemberton, B. Riha, R. Nichols, C. Eddy-Dilek, B. Looney, and J. Rossabi) for a continuous water sampling system. This system can be installed in the probe tip of a cone penetrometer or in a small diameter well. The advantage of this system is that water samples can be taken at different depths without removing the cone penetrometer rods from the hole.

Jerry Nelson of DOE-SR contacted C. Berry about traveling to Selma University and examining the experimental set up on a minority college grant. Upon approval, Berry will perform a technical evaluation of the setup.

DOE-SR Patent Council received notification from U. S. Patent Office that two patents will be allowed:

T. C. Hazen and G. López de Victoria. Stimulatory activity of trichloroethylene for positive chemotaxis by bacteria (S70102, S72580, S75569, S76275).

T. C. Hazen, Chemotaxis assay for biodegraders (SRS 89-027). Disclosure August 7, 1989.

A patent disclosure was filed by E. Wilde, M. Whitaker, and J. Radway on the use of unique algal strains isolated and cultured at SRTC for removing toxic pollutants from waste waters.

T. C. Hazen gave two invited seminars, one on Integrated *In Situ* Bioremediation Demonstration and the second on Bioremediation of DOE Waste Sites, in Bloomington, Indiana, at Indiana University.This was in conjunction with the Traveling Lecturer Program. T. C. Hazen also met with several faculty and discussed research possibilities with DOE.

T. C. Hazen gave an invited seminar on Bioremediation Needs and Future in December 1993, at Columbia, South Carolina, to the South Carolina University Research and Education Foundation Strategic Planning Committee.

C. B. Fliermans, "*Aerobiology*" was sent to the publisher.

C. B. Fliermans presented a ASHRAE position paper and position statement on Legionella in cooling systems. The paper addressed setting standards and guidelines for operation of cooling systems based on 14 years of experience at SRS. SRS has the largest database on operating cooling towers "free" of Legionella that exists in the world.

M. J. Parker, authored "Review of the Replacement Tritium Facility Tornado Dampers-(U)", (WSRC-RP-93-510), which was distributed this month.

Papers, Publications, Presentation, and Participation

C. L. Smith and M. H. Layton, "TSRs Development Approach".

C. L. Smith and M. H. Layton, "The Technical Specification Interpretation Process".

F. B. Ramirez, "The Whole Safety Documentation Spectrum -- In a Nutshell".

J. A. McCormick, "Developing a Strategy for Continuous Improvement and Savings through Sharing".

M. W. Geeting and P. B. Gerrard, "SRTC Support for Analytical Laboratories High Level Waste Transfer System Unreviewed Safety Question Resolution".

R. C. Edwards, "Assessing Impact of Activities on Dose Commitments in Realtime with Computer Modeling".

R. Voss is continuing to support Westinghouse Hanford in Upgrading the Safety Analysis of the Plutonium Finishing Plant.

B. Edwards is continuing to teach classes in the USQ process, and provided this support to the Environmental Restoration Department and Solid Waste Engineering.

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